

**Evaluation, Request for Determination of
Eligibility, and Effect for the
Los Vaqueros Project**

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PROJECT LOCATION AND DESCRIPTION

Contra Costa Water District (CCWD) is proposing to implement a water management project in eastern Contra Costa County (Figures 1 and 2). Among the alternatives being considered are a reservoir or combination of reservoirs on Kellogg Creek and a related water conveyance system. If a reservoir alternative is selected, it will be necessary to reroute petroleum and natural gas pipelines; electrical transmission lines; and a major portion of Vasco Road, including a section in Alameda County. A reservoir would be operated to meet two primary objectives: to improve the quality of CCWD's water supply and to provide emergency storage to significantly improve the reliability of CCWD's water supply system.

Water quality at CCWD's current water diversion point at Rock Slough in the Sacramento-San Joaquin Delta is subject to extreme seasonal fluctuations. In addition, CCWD presently has a limited storage capacity. In the event of a problem with the raw water supply or the delivery system, CCWD users could quickly lose water service.

In 1986, CCWD completed and certified the Stage 1 environmental impact report (EIR) for the Los Vaqueros Project and adopted a project concept consisting of a reservoir or combination of reservoirs in the Kellogg Creek watershed and appurtenant facilities. The Stage 1 EIR was completed as part of a staged approach to comply with the California Environmental Quality Act (CEQA). Acquisition of watershed lands was then initiated.

Two alternative reservoir sites on Kellogg Creek are under consideration. The Los Vaqueros Reservoir site could accommodate a reservoir with up to 100,000 acre-feet (af) of storage volume. The Kellogg Reservoir site could accommodate a maximum storage volume of 100,000 af.

Timing constraints prompted CCWD to separate the EIR for the Vasco Road and utility relocation facilities from the Stage 2 EIR/environmental impact statement (EIS) that addresses the main Los Vaqueros Project. This additional staging of the environmental documentation process ensures that an alternative roadway is in place before dam construction begins. CCWD certified the Vasco Road and Utility Relocation Project EIR in September 1990 under the State CEQA Guidelines to assess the impacts of relocating Vasco Road and several utility facilities.

The contractual arrangement of the U.S. Bureau of Reclamation (Reclamation) with CCWD and the potential for significant environmental impacts necessitate the preparation of an EIS with Reclamation serving as lead federal agency. A joint EIR/EIS is being prepared to comply with both CEQA and the National Environmental Policy Act (NEPA) and to avoid duplication of effort. The EIR/EIS will be an alternatives-oriented document that examines each alternative in essentially equal levels of detail. It will incorporate the Stage 1 EIR and the Vasco Road and Utility Relocation Project EIR.

Road and utility construction are scheduled to begin in late 1992 or early 1993 to permit dam construction in 1994-1995. The final Stage 2 EIR/EIS is also planned for

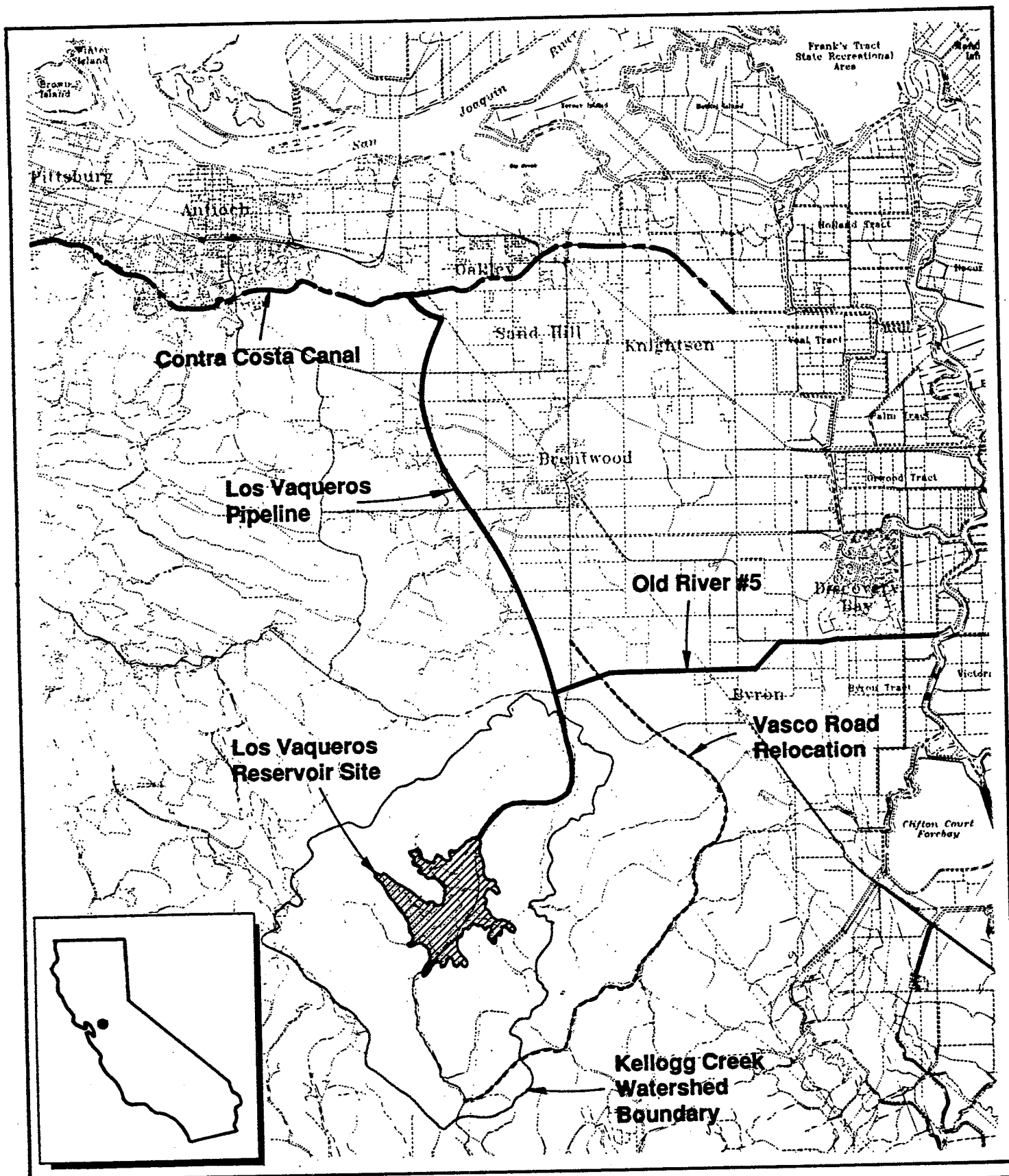


Figure 1. Los Vaqueros Project and Vicinity

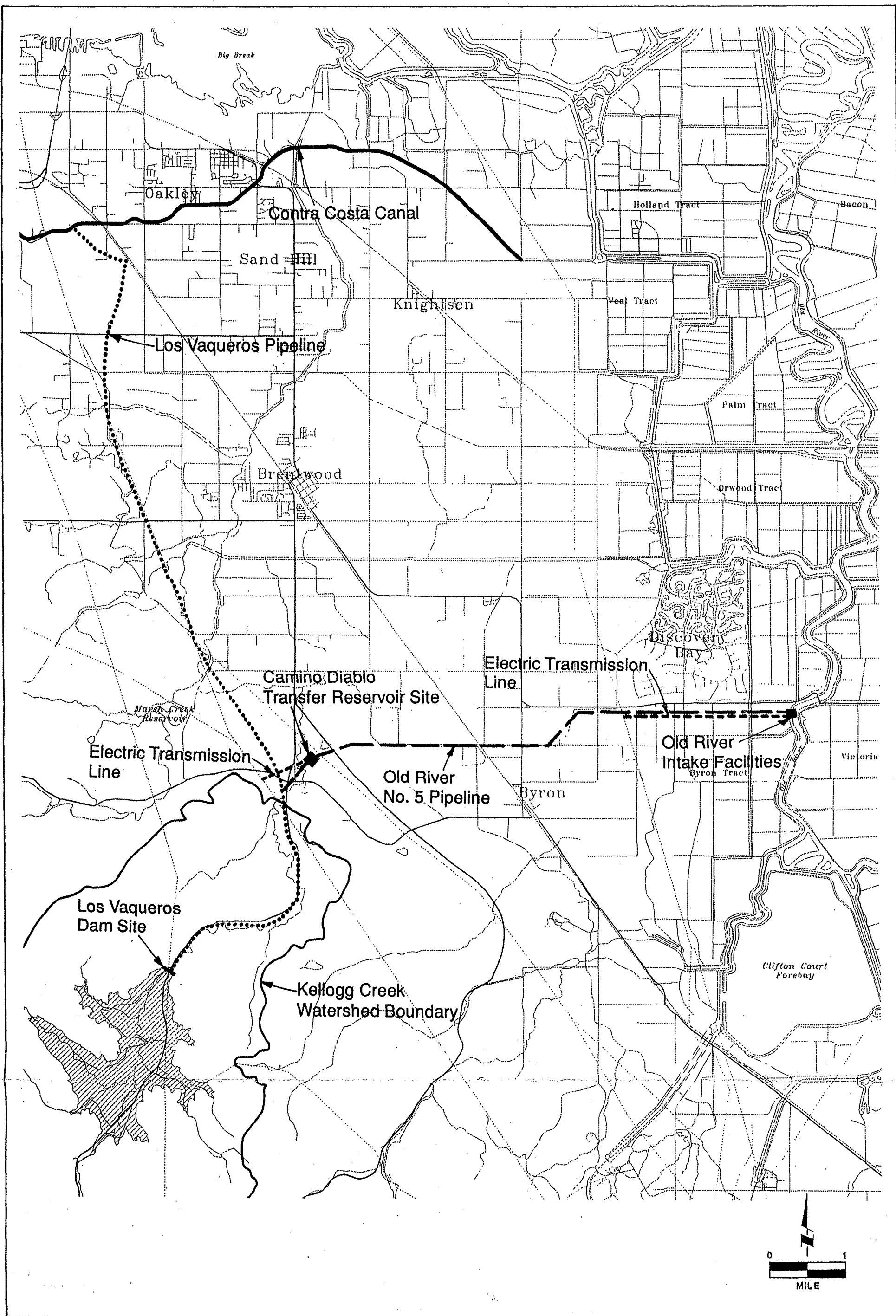


Figure 2. Location of Los Vaqueros Project Facilities

completion in 1992, and road construction will not begin until the Stage 2 EIR/EIS is certified, and a Section 404 permit is obtained from the U.S. Army Corps of Engineers (Corps).

REGULATORY CONTEXT

The most important federal policies applicable to archeological and historical resources are in the National Historic Preservation Act of 1966 as amended (PL 89-665, 96-515), NEPA (PL 91-190), and the implementing regulations associated with them. These statutes and regulations, as well as others that also apply to cultural resources (e.g., PL 93-291), cover all projects considered to be federal undertakings (i.e., projects that include federal land, are supported by federal funds, or require a federal permit). This procedure includes a consultative process to ensure that potentially important historic resources have been adequately considered in project planning.

The National Register of Historic Places (NRHP) was established by statute to list sites deemed to have historical importance (36 CFR 60). Any federal action that could affect a cultural resource listed in or eligible for listing in the NRHP is subject to review and comment under Section 106 of the National Historic Preservation Act. Impacts on these historic properties must be considered in accordance with the regulations of the Advisory Council on Historic Preservation (36 CFR 800). Unless cultural remains possess the qualities specified by CEQA or other laws, they usually do not require management consideration.

In cases such as the Los Vaqueros Project where both the CEQA and NRHP evaluation criteria apply, federal standards prevail. Historic properties assessed as NRHP-eligible are also considered "important", and procedures for managing these properties under 36 CFR 800 satisfy the State CEQA Guidelines as well. Specific significance criteria are presented below.

PREVIOUS INVESTIGATIONS IN THE PROJECT AREA

Cultural resources studies for the Los Vaqueros Project began in 1964 when archeologists from San Francisco State University, working under the National Park Service, surveyed the then-proposed Kellogg Reservoir area (Treganza 1964). In 1967, a large prehistoric site in the project area (CA-CCo-310) was excavated (Hardy 1967), but a technical report was not produced.

A hiatus followed until 1979 when a student from California State University, Hayward, began excavations at CA-CCo-417 (Parkman 1979). That same year, a team from California State University, Sacramento, prepared a planning summary and recommendations for preliminary field studies for several reservoir locations, including the Los Vaqueros Reservoir site (Russo and McBride 1979). Shortly thereafter, the California Department

of Water Resources (DWR) contracted with Sonoma State University (SSU) to perform cultural resources surveys for the project. SSU has continued work for the Los Vaqueros Project under contract with CCWD. These studies have been directed by David A. Fredrickson, Ph.D., who has been assisted by SSU graduate students and others.

SSU began its first study for DWR in 1981, which consisted of a cultural resources inventory of the Los Vaqueros Reservoir and Kellogg Forebay areas (Fredrickson 1982). The study included an overview of previously identified resources, background research, and a field reconnaissance of 8,100 acres. Ethnographic research was an important element of this study. Ethnohistoric and ethnolinguistic data were collected to help determine the prehistoric and protohistoric occupants of the Los Vaqueros area.

In 1986, SSU conducted a survey for the Kellogg Reservoir site for CCWD (Eidsness 1986). Historical research was conducted and 1,030 acres were surveyed. In 1988, SSU surveyed an additional 7,000 acres of land within the Kellogg Creek watershed for CCWD (Bramlette et al. 1988) and documented the findings of the survey; summarized the previous reports; and made management recommendations for each site within the project area, as it was then defined.

For CCWD's Vasco Road and utility relocation project, surveys were conducted in 1989 and 1990 of the areas not previously examined during earlier reconnaissance surveys (Bramlette et al. 1990). This report presented the findings of the field reconnaissance, summarized the findings of the previous studies, and provided recommendations for the selection of road and utility alignment alternatives.

Most recently, SSU undertook a study of the areas planned for the alternate water conveyance pipelines, desalination plant, and related facilities. Included in this report were findings from the reconnaissance of areas near Round Valley, which could not be surveyed previously because of lack of access.

The results of several other cultural resource investigations have also been used in this analysis, including those for proposed windfarm developments, proposed landfill projects, and two smaller developments (Bramlette 1987; Holman 1982, 1983, 1984a, 1984b, 1985; Holman et al. 1985; Keswick and Bramlette 1987; Neeley 1978; Porter et al. 1980; Wiberg 1984a). Additionally, portions of the investigations for the East County Corridor Study overlapped with the Los Vaqueros Project area (Fredrickson et al. 1988), the findings of which have been incorporated into this study.

SSU prepared a summary archeological inventory report that provides a synopsis of all sites within the area of potential effect (APE) for the project, a preliminary assessment of their potential eligibility for inclusion in the NRHP, and recommendations for further work. This report provided the basis for Reclamation's initiation of consultation with the Office of Historic Preservation (OHP) and was used to guide future cultural resource evaluation and mitigation efforts.

An architectural inventory of the properties located within the APE was completed in late 1991. This report documented the findings of SSU's 1991 architectural inventory and provided evaluations and recommendations for treatment of architectural properties.

DELINEATION OF THE AREA OF POTENTIAL EFFECT AND DISTRICT CONCEPT

The APE for the project area has been defined as the Upper Kellogg Creek watershed, the location of proposed project facilities, and linear corridors adjacent to water conveyance facilities that extend from the watershed to the Delta. Delineation of the APE as the watershed is based on three lines of reasoning:

- all possible immediate and future effects of the project are considered,
- a research universe is established for cultural resource assessment based on an environmental reality rather than an arbitrary project area boundary, and
- information from the inventory phase suggesting that resources in the watershed may represent a cultural continuum is incorporated.

Based on this reasoning, it seems most appropriate that resources within the watershed be evaluated within the framework of a historic district.

By viewing the project area as a district, the interrelationships of individual sites and clusters of site types can be assessed in terms of their functional similarities or disparities. This research vantage point provides the linkage between the archeological record and the research universe. Each site can be assessed as an element of this universe that may have the potential to contribute to understanding human adaptation over space and time in the Los Vaqueros area.

Sixty-eight archeological sites have been identified within the APE for the Los Vaqueros Project (Maps 1 and 2). Although federal guidelines allow the NRHP status of each site to be assessed individually, the option also exists to examine these properties as elements of a district.

According to National Park Service guidelines, the distinctive characteristic of an NRHP district is that it "possesses a significant concentration, linkage, or continuity of sites . . . united historically" (National Park Service 1986a). The boundary of the proposed district is the APE of the Los Vaqueros Project. This area is both a distinct physiographic unit (the watershed of Kellogg Creek) and an important historical division, as it contains most of the Canada de Los Vaqueros land grant. As is demonstrated in the archeological and historical overviews that follow, these characteristics were important influences on the area's settlement pattern, resource use, and overall developmental history. Thus, the range of types of archeological sites within the study area represents the kind of historically and

*No
must confine
to the district
of sites -
consider
discontinuous
district*

functionally associated properties appropriately considered as an NRHP district (National Park Service 1982).

To construct a district, it is necessary to assess each site's ability to contribute to the district's theme and period of significance as defined in the historical context. Properties irrelevant to the theme and/or with poor integrity are considered "noncontributing elements" of the district. Specifically:

a noncontributing building, site, structure, or object does not add to the historic architectural qualities, historic associations or archeological values for which a property is significant because a) it was not present during the period of significance, b) due to alterations, disturbances, additions, or other changes, it no longer possesses historic integrity reflecting its character at that time or is incapable of yielding important information about the period, or c) it does not independently meet the National Register criteria (National Park Service 1986b).

Thus, a property's NRHP-eligibility status may be assessed either individually, as an element of the proposed district, or both.

PRESENT ENVIRONMENT

Regional Setting

Contra Costa County is in west-central California, southeast of San Pablo Bay and south of Suisun Bay. The north-central part of the county borders the confluence of the Sacramento and San Joaquin Rivers. The eastern part of the county, within the San Joaquin Valley and the Delta, is nearly level. The central part of the county ranges from nearly level land to sloping valleys. The rest of the county consists of steep to very steep uplands. Mt. Diablo, at an elevation of 3,849 feet, is the county's dominant landmark.

The project area encompasses the rolling foothills of the inner South Coast Ranges and adjacent bottomlands of the San Joaquin Valley. The area is noted for its dramatic transitions from the typical grassland, alkali wetland, and Delta marsh communities of the San Joaquin Valley to the foothill environments where grasslands, oak woodlands, and chaparral mix.

Portions of the project area encompass a strip along the west edge of the San Joaquin Valley from Clifton Court Forebay north to the confluence of the San Joaquin and Sacramento Rivers. Other portions of the project area encompass the inner South Coast Ranges from near Altamont Pass north to Antioch, east of Morgan Territory Road.

The proposed reservoir area is located in the upper portion of the Kellogg Creek watershed, with the water conveyance system located in the flat lands surrounded by the

Sacramento-San Joaquin Delta to the north and northeast. The terrain of the reservoir vicinity is marked by southeast- and northeast-trending valleys through which the waters of Kellogg Creek and its tributaries flow through lands bordering the Delta. The hills bordering the valley system range from about 130 to 1,100 feet above sea level, while the northern flatter lands range from sea level toward the east to 125 feet to the west.

Climate

The Mediterranean climate of the project area is characterized by wet winters that are mild to moderately cold, alternating with hot, dry summers. About 90% of precipitation occurs during November through April, with seasonal averages varying from about 13 inches to the east to 17 inches to the west (California Department of Water Resources 1981).

Geology

Contra Costa County is located predominantly within the Coast Ranges geologic province. The Coast Ranges province consists of complexly folded and faulted Tertiary marine and nonmarine formations and Cretaceous marine formations (AGS 1989). Recent surface deposits have originated from alluvial fans, streams, and landslides.

The eastern part of the county is in the Great Valley portion of the Sierran Block province. This area consists of deep alluvial materials underlain by basement rock of the Sierran Block province.

The Kellogg Creek watershed is a combination of flat, hilly, and mountainous terrain. Most of the upland areas are underlain by upper Cretaceous marine sedimentary rocks of the Panoche Formation (65 million years old). These rocks are characterized by massive, cavernous weathering of surface materials and consist of concretionary sandstone, shale, siltstone, and conglomerate lenses. The massive sandstone outcrops that have been created from these formations are of particular importance because of their use by Native American inhabitants as locations for shelter and bedrock milling stations.

Other geologic formations (Meganos, Moreno, and Deer Creek) are also present and have properties similar to those of the Panoche formation. In most areas, bedrock is encountered at depths of 25 feet or less. Rock outcrops are commonly found on ridges and hilltops. This outcrop pattern is common in the Coast Ranges province. The area bedrock ranges from soft to hard and from fractured to massive states. The low-lying areas comprise recent alluvial deposits derived from adjacent upland materials.

Soils

Two major soil associations are found in the Kellogg Creek watershed: the Altamont-Diablo-Fontana association and the Brentwood-Rincon-Zamora association. The Altamont-Diablo-Fontana soils are characteristically well-drained clays and silty clays that

form on strongly sloping to very steep uplands. The Brentwood-Rincon-Zamora soils are well-drained clay loams and silty clay loams that form on nearly level surfaces.

State Source
The Los Vaqueros region is known to contain deep sediments dating from both the Cenozoic and Mesozoic (California Department of Water Resources 1981). Extensive and often deep Holocene alluvium and fan deposits cover lowland areas. Deeply buried archeological deposits have been observed at sites within the project area and in adjacent areas.

Also of importance is the Piper Formation, located in the northern lowland portion of the project area. This formation consists of fine sandy loam and loamy sand components, usually buried beneath later deposits such as the Oakley sand (Cook and Elsasser 1956). Archeological materials and human graves have been found deeply buried in indurated Piper sands of the project vicinity (Jackson and Fredrickson 1979).

Vegetation

Floristic Setting

The project area is located in a zone of biogeographical transition between lowland grasslands and higher elevation woodland and chaparral habitats, and southern and northern elements of the Coast Ranges flora. Many of the plant communities that typified vast acreages of the San Joaquin Valley before it was converted to agricultural and urban uses exist in the project area. Of particular regional significance is the presence of mesquite, Palmer's oak, desert buckwheat, and Mormon tea, species typically associated with the Mojave Desert and arid portions of the southern Coast Ranges. These plants reach their northern range limits in the Los Vaqueros-Corral Hollow area (California Department of Water Resources 1978).

The project area encompasses a variety of topoedaphic settings that have a marked influence on the local vegetation. Hillsides and uplands with well-drained soils support annual grasslands and oak woodlands. In the valley bottoms, where flat or gently sloped alkali soils have formed on thick alluvium, a mosaic of seasonal alkali wetland communities in low-lying areas is present. Annual grasslands fringe the alkali wetlands and typically occupy higher well-drained soil inclusions in the valley bottom. These valleys are traversed by meandering, deeply incised intermittent creeks that have narrow strands of marsh vegetation in the channels and occasional willow or cottonwood trees or small riparian woodlands along the creek banks.

To the northwest of the project area, Mt. Diablo State Park has been identified as an endemic plant region by Bowerman (1944) and Stebbins and Major (1965). To the north, the Antioch Dunes are a relict example of a historically widespread dune community that was probably scattered throughout the Delta region. Stebbins and Major (1965) and Hoover (1939) identified the region east of the project area as the San Joaquin Valley endemic flora region. This area is noted for its endemic plant taxa; vernal pool and alkali sink scrub

vegetation; and differentiation and speciation of several plant taxa, such as goldfields (Stout and Wainright 1980) and mousetails (Stone 1959).

Natural Communities

Grassland Communities. Grassland communities are typically herbaceous, but may support widely scattered buckeye, blue and interior live oak, or occasional shrubs. Annual grassland and valley needlegrass grasslands are the two grassland types that occur throughout the project area, extending from valley bottoms to ridges of adjacent foothills. Valley needlegrass grasslands in the project area have survived despite more than 100 years of livestock grazing in the area.

Alkali Wetland Communities. Alkali wetland communities, including alkali grassland, alkali meadow, valley sink scrub, alkali marsh/seep, and northern claypan vernal pools, develop in flat or gently sloped valley bottoms with alkaline soils. Variation in soil, topography, and surface drainage in these valleys creates a mosaic of habitats, each occupying a distinct position along a hydrologic gradient. Alkali grasslands occur in drier areas; alkali meadows, valley sink scrub, and alkali marshes occur at successively wetter sites. Drainages and northern claypan vernal pools are interspersed within this mosaic. Alkali marshes are interspersed with alkali meadows in stringers along both Brushy and Kellogg Creeks. Alkali marshes are similar to freshwater marshes in structure, but occur on alkaline soils and support halophytic species and typical freshwater marsh species such as tules and cattails.

In the project area, alkali wetland communities are found in the northeast and south-central portions of the Kellogg Creek watershed. Beyond the watershed, alkali wetlands, including alkali grasslands, meadows, and marshes; valley sink scrub; and northern claypan vernal pools exist in valley bottoms from the watershed east to Byron Tract, north beyond the City of Byron, and south to Altamont Pass and beyond. Additional communities are scattered throughout the foothills along the western edge of the San Joaquin Valley.

Intermittent Pool Communities. Intermittent pools are unique vegetated seasonal wetlands. One such community, known as valley rock outcrop intermittent pools, occurs in the project area. These communities form in depressions in sandstone outcrops found along ridgetops of the watershed and adjacent foothills to the west. Valley rock outcrop intermittent pools qualify as jurisdictional wetlands and are important because they are extremely rare and are important to dependent plant and wildlife species.

Riparian Woodland Communities. Riparian woodland communities, including willow-cottonwood riparian woodland, central coast live oak riparian woodland, and mixed riparian woodland, occur as narrow strips of woody vegetation along intermittent drainage and creeks throughout the project area. These communities are concentrated along Kellogg and Brushy Creeks.

Chaparral Communities. Chaparral communities in the project area include Diablan sage scrub and northern mixed chaparral that occur on rocky east- and north-facing slopes along ridges west of Vasco Road and along dry rocky slopes, ridges, and disturbed

sites in the project area. They are dominated by evergreen, woody shrubs with a subshrub layer, and a variety of annual and perennial herbs.

Oak Woodland Communities. Oak woodland communities, including valley oak woodland, blue oak woodland, live oak woodland, and mixed north slope cismontane woodland, occur in valley bottoms and on gentle to steep slopes throughout the project area. Valley oaks were observed in two topographic settings in the project area: along creeks and drainages and in deep alluvial soils in valley bottom floodplains. Communities along creeks and drainages are referred to as valley oak woodlands because they typically are clustered in stands of five to 50 trees, with dense canopy cover and a sparse understory. Communities in valley bottom floodplains are referred to as valley oak savannas because they typically consist of widely spaced individuals or small clusters of two to five trees interspersed with large areas of annual grasslands.

Valley oaks appear to be hybridizing with blue oaks because some trees observed had intermediate leaf size, shape, and color; bark characteristics; and growth habit. Hybridization in oaks, including valley and blue oaks, has been reported throughout California (Howitt and Howell 1973, Sargent 1918, Twisselman 1969). In the project area, valley oaks with hybrid characteristics were consistently observed along steep hill slope drainages and other relatively dry microhabitats, while pure valley oaks were consistently found in relatively flat areas and along intermittent creeks of valley bottoms. A possible explanation for this observation is that the drought-tolerant characteristics of blue oaks may permit the putative hybrids to occupy drier microhabitats than pure valley oak.

Brackish Marsh Community. Brackish marsh occurs along the interior edges of coastal bays, deltas, and estuaries and is most extensively developed around Suisun Bay in the Delta. In the project area, this community occurs adjacent to the Sacramento-San Joaquin River, northwest of Pittsburg along the desalination brine disposal pipeline. This community provides important habitat for dependent plant and wildlife species.

Wildlife Associated with Major Habitats

Grasslands

Grassland is the most common habitat type in the project area. Many wildlife species use grasslands for foraging and nesting. Grasslands near open water and woodland habitats are used by the greatest number of wildlife species. Water and riparian and oak woodlands provide places for resting, breeding, and cover. Amphibians and reptiles residing in grasslands include Pacific treefrogs, western fence lizards, and gopher snakes. Birds known to breed in grasslands include horned larks, western meadowlarks, and burrowing owls. Mammals include deer mice, desert cottontails, California ground squirrels, striped skunks, and coyotes.

In spring, grasslands provide most of the forage used by black-tailed deer. Small mammals in grasslands are important prey for a variety of predatory birds and mammals,

including golden eagles, prairie falcons, American kestrels, red-tailed hawks, foxes, and coyotes. Heavily and moderately grazed areas tend to support moderate to high populations of ground squirrels; lightly grazed or ungrazed areas support fewer squirrels, but higher populations of voles.

Wetlands

Several wetland communities are present in the project area, including streams, stock ponds, alkali marshes, alkali meadows, vernal pools, and rock outcrop intermittent pools. Kellogg and Brushy Creeks are small, intermittent streams that flow during winter and early spring. During low- or no-flow periods, pools comprise the only aquatic habitat for resident amphibians and reptiles.

Alkali marsh habitats generally occur in narrow bands along pond margins, creeks, and drainages in the area. Relatively little marsh vegetation exists in the project area, and most of it is in narrow strands degraded by livestock. Marshes provide habitat for a variety of wildlife species, including shorebirds, songbirds, northern harriers, and raccoons. Dabbling ducks, such as mallards and cinnamon teal, nest in small numbers in the cattails and grasses along pond margins.

Alkali meadow habitats support many wildlife species that occur in nearby upland sites. When flooded, these meadows attract a variety of waterfowl and shorebirds. During dry periods, alkali meadows provide habitat for upland bird species, such as western meadowlarks and loggerhead shrikes, and numerous small mammals.

Vernal pools are an ephemeral aquatic habitat to which several invertebrate and amphibian species have adapted. Aquatic invertebrates, such as fairy shrimp and crawling water beetles, inhabit standing water; amphibian species, such as western toads, various salamander species, and Pacific treefrogs, use the water for laying eggs and rearing young.

Several intermittent pools associated with rock outcrops are located in the portion of the watershed east of Vasco Road. Some pools support several endemic California fairy shrimp species. The pools provide a temporary drinking water source for many wildlife species.

Riparian Woodlands

Riparian woodlands occur along intermittent creeks in the project area. The riparian woodland community is used by a variety of wildlife species. This habitat produces abundant aquatic and terrestrial invertebrates that are prey for amphibians and reptiles, such as California slender salamanders, common garter snakes, western skinks, and ringneck snakes, as well as insectivorous birds, such as warblers, northern flickers, downy woodpeckers, and flycatchers. Small mammals found in riparian habitats include shrews, voles, bats, and mice. Raptors that nest in large riparian trees include great-horned owls, red-tailed hawks, and American kestrels. Cavity-nesting species, such as woodpeckers, bats, squirrels, and

raccoons, require mature stands of trees. Striped skunks, raccoons, red foxes, gray foxes, and badgers forage in riparian habitats and use them for cover and travel. Black-tailed deer use riparian areas for feeding and cover and as travel routes.

Blue and Live Oak Woodland

Oak woodlands in the project area vary from sparse stands with a grass understory to denser stands of oaks with well-developed shrub understories. Oaks and their associated shrub species provide food, shade, shelter, and nesting habitat for many wildlife species. Several specialized wildlife species depend on oaks. Oak mast (acorns) is an important food source for acorn woodpeckers, band-tailed pigeons, western gray squirrels, and black-tailed deer (Verner and Boss 1980). Oak trees provide nesting sites for golden eagles and red-tailed hawks, and for cavity nesters, such as western bluebirds and American kestrels. Many amphibian and reptile species live in the cool, shady areas beneath oaks, including ensatinas, Gilbert's skinks, ringneck snakes, and racers. Shrub species such as manzanita, sage, buckbrush, and toyon, which provide cover and a food source for wildlife species, enhance the value of the oak woodlands.

Resident deer occur primarily in oak and chaparral habitats on the west side of Kellogg Creek but are also present in scattered oak woodlands east of Kellogg Creek. Deer density in the project vicinity is nearly three times higher in chaparral than in woodland habitat (California Department of Fish and Game 1983), although overall deer population density is low throughout the project area.

Chaparral

Chaparral habitat dominates steep, upper elevation slopes with shallow soils in the western portion of the watershed area. Chaparral is common in the Central Valley foothills of California. Amphibians and reptiles that use chaparral include the Alameda whipsnake, ensatinas, western fence lizards, western skinks, racers, and common kingsnakes. Wrentits, rufous-sided towhees, and California thrashers are common birds in chaparral. Mammals include ornate shrews, California pocket mice, gray foxes, and black-tailed deer. Wildlife species diversity is higher at the habitat edges where chaparral abuts grassland, oak woodlands, and rock outcrops.

Rock Outcrops

Rock outcrops, especially undisturbed sites suitable for raptor nesting, are relatively uncommon in California and in the watershed area. The most important kind of outcrop is cliffs, which provide nesting areas for raptors and other birds. Cliffs suitable for raptor nesting are nearly vertical walls at least 20 feet tall with ledges, potholes, or other recesses to support nests. Cliffs in the area provide important nesting habitats for many raptors, including golden eagles, prairie falcons, red-tailed hawks, turkey vultures, common barn

owls, and great-horned owls (Jones & Stokes Associates 1989). Ravens also commonly nest on cliffs in the project area. Cliff swallow colonies occur on several rock faces.

PALEOENVIRONMENT

Holocene paleoenvironmental reconstructions that focus specifically on the Los Vaqueros area are lacking. Most regional paleoenvironmental research targeted at characterizing the Pleistocene-Holocene boundary and the Holocene has been based on palynological, pedological, and geomorphological data derived from the Sacramento-San Joaquin Delta, San Francisco Bay and the north coastal region. The inherent limitations of such data and the perils of extrapolating from such data in an attempt to reconstruct a specific paleoenvironmental setting have been explored by Potter (1964), Janssen (1966), Tauber (1967), Havinga (1971), and others. Although the research results discussed below provide a regional paleoenvironmental context, accurate synchronic and diachronic paleoenvironmental reconstructions for the Los Vaqueros region, in particular for the upper portion of the Kellogg Creek watershed, must await area-specific research that can then be compared and contrasted with other regional data.

Palynological Studies and Past Climate

Palynological and other paleoenvironmental studies in coastal California north of the present study area present a Holocene paleoenvironmental portrait that appears to reflect somewhat greater climatic change and subsequent biotic responses than in the Sacramento-San Joaquin Delta. West (pers. comm.) has identified key points that must be considered when developing this thesis, including:

- taxon exhibit individual response to climatic change relative to their tolerance to changing conditions and
- plant communities are dynamic and changes in composition and structure are influenced by multiple factors, including climate.

West (pers. comm.), in providing information that supports the following Holocene scenario proposed for the north Coast Ranges, has suggested:

- since the Pleistocene, there has been a replacement in upland plant communities dominated by pine and taxodiaceae, cupressaceae, and taxaceae families (TCT) (e.g., incense cedar, juniper, redwood, yew, and cypress) pollen producers to more complex communities with greater diversity and possibly greater cover during the last 3,000 years;
- the post-Pleistocene expansion of oaks peaked about 5,000 years before the present (B.P.);

- Douglas fir has become more abundant in the last 2,000-3,000 years in the north Coast Ranges, at times co-occurring with tan oak;
- shifts in the extent of vegetation change between the north coastal region and the Delta may relate to shifts in the position of the subtropical high and its effect on the mean airstream flow; minor shifts in the flow can result in significant effects on regional climate and vegetation;
- native grasses have been substantially replaced by introduced taxa; and
- there is some evidence during the historic period for both movement of arboreal species into grasslands and expansion of grasses and shrubs in arboreal zones.

In contrast to the north Coast Ranges, Holocene palynological data for the Sacramento-San Joaquin Delta that have been derived from archeological contexts are inconclusive; data from nonarcheological settings do not provide unequivocal evidence for climatic change (West 1977). More recently, West (pers. comm.) has reiterated that the paucity of fossil plant data for lowland regions of northern and central California limit the ability to reconstruct Holocene vegetation communities in the region.

Development of the Bay and Delta System

While the paucity of palynological data has limited certain aspects of paleoenvironmental reconstruction for the San Francisco Bay and Sacramento-San Joaquin River Delta system in contrast to the north Coast Ranges, a considerable body of geomorphological and archeological data have been employed to reconstruct the late Pleistocene and Holocene nature of these systems. Atwater (1979) has suggested that development of the existing San Francisco Bay and Sacramento/San Joaquin river delta systems began about 15,000-18,000 years ago, when the glaciers of the last ice age started their retreat:

At this time depth, the Pacific Ocean lapped against a shoreline located near the Farallon Islands. In order to meet this shoreline, the combined Sacramento and San Joaquin Rivers must have flowed through the Golden Gate and traversed an exposed continental shelf Most of the submergence that transformed this landscape occurred earlier than 5,000 years ago. Initial migration of shorelines brought the rising sea into the Golden Gate about 10,000 years ago (Atwater 1979).

By 5,000 years ago, relative sea level changed more slowly because by then glaciers had been reduced to approximately their present size. By about 6,000-7,000 years ago, the flooding caused by rising sea levels initiated the development of an extensive saltwater/freshwater tidal marshland in what is now the Sacramento/San Joaquin Delta. Bickel (1978) linked the growth of the Bay and Delta estuarine system to the region's archeological record, noting that the rise in sea level should have: 1) flooded evidence for early occupation along the bayshore; 2) submerged lower portions of many sites; 3) changed San

Francisco Bay shellfish populations; and 4) stimulated the development of an estuarine subsistence focus. Bickel (1978) suggested that major use of San Francisco Bay occurred when marshes were well developed, shellfish populations were established, and estuary productivity had matured, probably about 2,500 B.P.

Human occupancy in the Sacramento/San Joaquin Delta was probably associated with similar developments. Schulz (1975) pointed out that radiocarbon dates from Delta archeological sites are no older than 2500 B.C., by which time the marshland habitats would have been established. It is likely that the use of Piper sands for human graves occurred after the Delta ecosystem developed but before its maturity. Cook and Elsasser (1956) concluded that the sand mound burial sites were used during the initial portion of the Berkeley Pattern, its beginnings dated in the San Francisco Bay Area to about 3,500 B.P. (e.g., Moratto 1984, Ragir 1972).

Fredrickson (1980), in a research design prepared for archeological work to be implemented by the Corps along Walnut Creek and several of its tributaries, noted that deeply buried archeological sites commonly occurred in the study area. Because these occurrences suggest "climatic events of some moment", paleoenvironmental reconstruction was an important research goal.

Banks et al (1984), in the final report on the Corps' archeological project, used information obtained from 17 archeological sites located in the Pleasanton, Danville, Alamo, Walnut Creek, and Concord vicinity to the west of Mt. Diablo to identify periods of intense soil deposition, with the assumption that such periods were markers of major climatic change. Three periods of intensive soil deposition were recognized, the earliest at about 2,700-2,800 B.P., correlated with the onset of the Recess Peak Glacial Advance. The authors also observed that "an increased deposition of sediments might have resulted from a . . . period of heavy rainfall following a period of relative aridity". It was also noted that the climatic change implied here also marked the end of the Windmill Pattern and its replacement by the Berkeley Pattern.

Banks et al. (1984) also identified another period of intense soil deposition that occurred between about 1,700 and 1,550 B.P. at four archeological sites in his study area, noting a correlation between this deposition and an apparent increase in deposition within the Recess Peak period noted by Byrne (1978) that occurred between 1,900 and 1,500 B.P. The authors noted that the Berkeley Pattern ended at this time to be replaced by the Augustine Pattern (Banks et al. 1984). The onset of the Matthes Glacial Advance, about 700-600 B.P., was the next major climatic event, correlated with a third period of intense deposition that occurred around 600 B.P. Again, the onset of a cool, wet climate was preceded by a period of general aridity (Banks et al. 1984). Although the dividing line between Phase 1 and Phase 2 of the Augustine Pattern is usually placed about 500 B.P., a possible correlation between this event and the period of soil deposition was suggested.

Postulated Resource Availability in the Prehistoric Period

Simons' (1982) reconstructions of seasonal availability of plant and animal resources and their occurrence by environmental zone are provided here, adapted from his original tables. Although not all the listed flora and fauna had equal importance because of differences in abundance, possible nutritional contributions, and dietary preferences, these data are important because seasonal subsistence rounds during the prehistoric period are based on the assumption that such rounds were strongly influenced by the distribution, availability, and abundance of certain plant and animal resources; even potential foods that occurred in low frequency could have had other than caloric value. Data in Figures 3, 4, and 5 were developed by Simons to show postulated seasonal availability for plant and animal resources in the vicinity of the Los Vaqueros Project.

PREHISTORIC BACKGROUND

Regional Prehistory

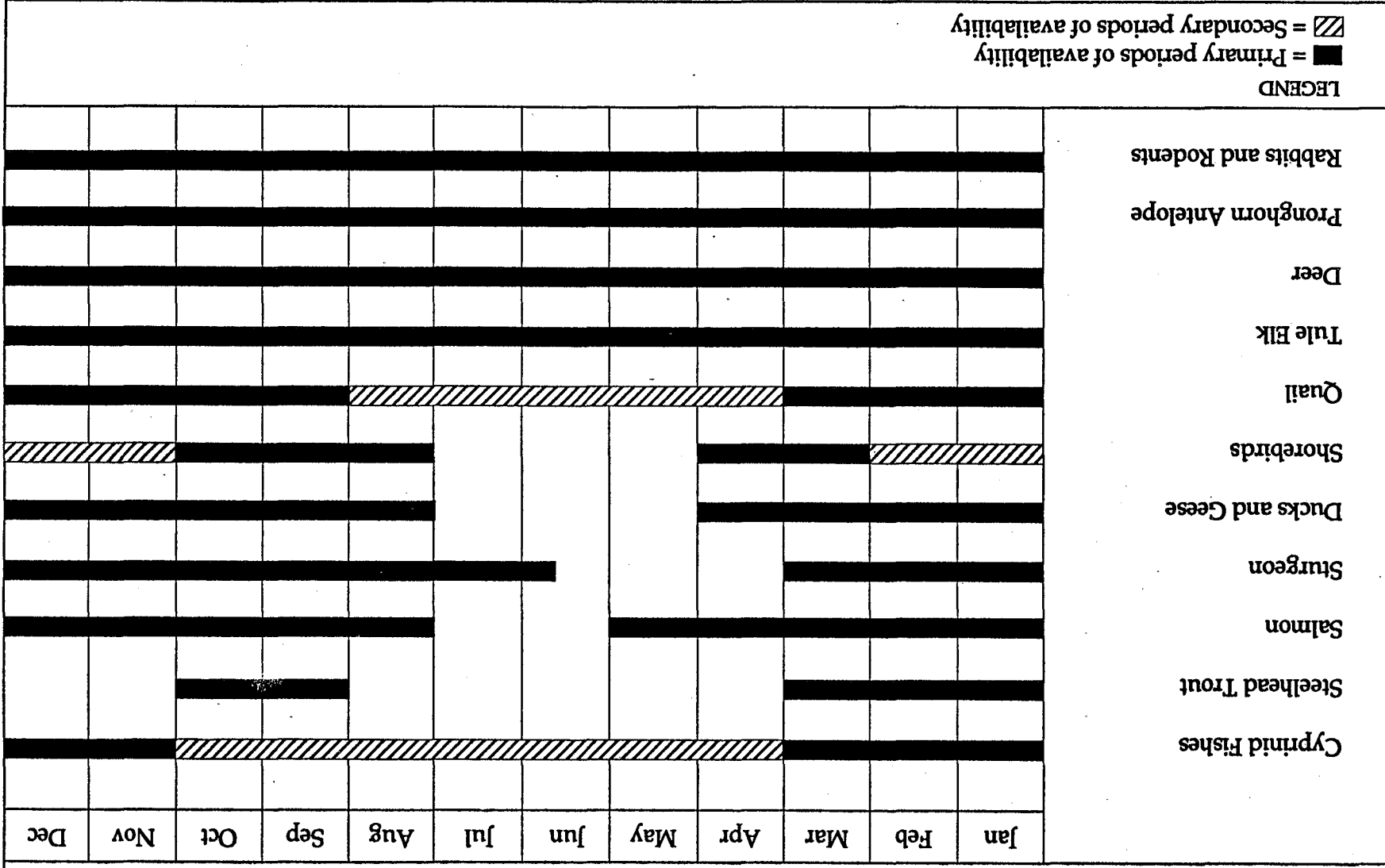
Because of its juxtaposition between the Bay Area and the Central Valley/Sacramento-San Joaquin Delta, discussions of prehistoric research for the Los Vaqueros locality must include information from both regions. Because both areas have been the focus of considerable archeological investigation and extensive information is available for both, the following outlines only those developments that figure prominently in research issues discussed below.

Early archeological investigations in central California focused on establishing chronological sequences using temporally sensitive artifacts found in burial association. In 1939, three basic periods were identified: the Early Period (2500-1500 B.C.), the Middle Period (1500 B.C.-500 A.D.), and the Late Period (500-1800 A.D.) (Lillard and Purves 1936, Lillard et al. 1939, Moratto 1984).

In the late 1940s, Beardsley focused on the question of the applicability of the central California sequence to the Bay Area. His refinement of the system resulted in the Early, Middle, and Late periods being renamed "horizons", which were then subdivided using terms such as "zone", "province", "facies", and "component" based on the intersite and intrasite similarities or dissimilarities of the archeological manifestations (Beardsley 1954). The result of this work was the development of the Central California Taxonomic System (CCTS).

Although Beardsley's approach built additional flexibility into the system, his ad hoc expansion of the program into other areas was seen as problematical, especially in light of data suggesting that the Early, Middle, and Late Horizons did not occur contemporaneously in central California. Gerow (1968) substantiated this by presenting evidence that "Early" and "Middle" expressions had existed simultaneously for a substantial amount of time in the

Figure 3. Postulated Seasonal Availability of Animal Resources
in the Los Vaqueros Reservoir Vicinity



Adapted from Simons 1982.

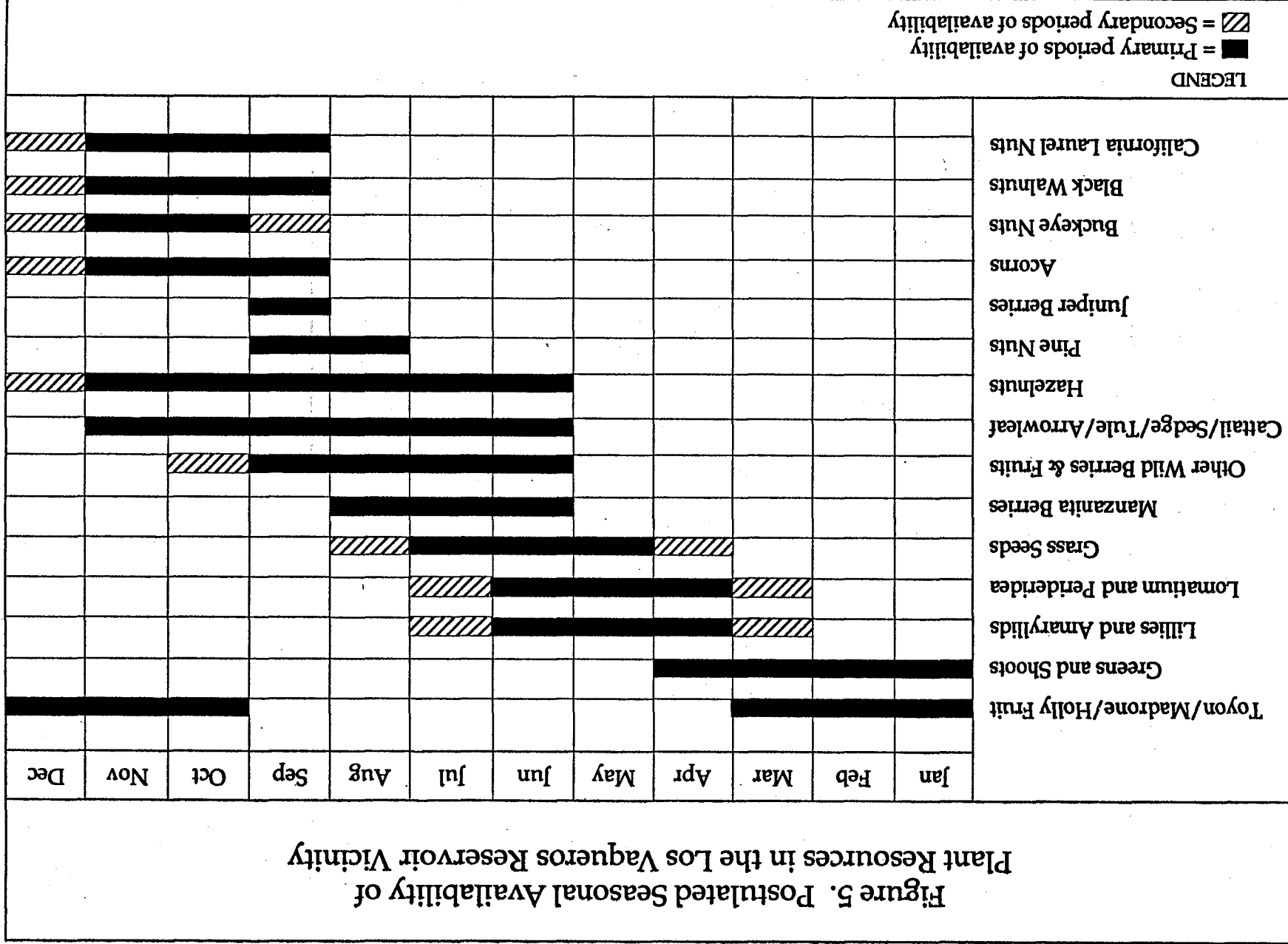
Figure 4. Postulated Availability of Resources
in the Los Vaqueros Reservoir Vicinity by Habitat

	Grassland	Woodland	Chaparral	Riparian	Marshland
Greens and Shoots	✓	✓	✓	✓	✓
Lomatium and Perideridea	✓	✓	✓		
Grass Seeds	✓	✓	✓		
Manzanita Berries	✓	✓			
Other Wild Berries and Fruits		✓	✓		
Cattail/Sedge/Tule/Arrowleaf				✓	✓
Hazelnuts				✓	
Pine Nuts		✓	✓		
Juniper Berries			✓		
Acorns		✓	✓	✓	
Buckeye Nuts		✓	✓	✓	
Black Walnuts				✓	
California Laurel Nuts		✓	✓	✓	
Toyon/Madrone/Holly Fruits		✓	✓		
Fish					✓
Ducks and Geese	✓			✓	✓
Shorebirds	✓				✓
Quail		✓	✓	✓	
Tule Elk	✓	✓			✓
Deer		✓	✓	✓	
Pronghorn Antelope	✓				
Rabbits and Rodents	✓	✓	✓	✓	✓

Adapted from Simons 1982.

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Figure 5. Postulated Seasonal Availability of
Plant Resources in the Los Vaqueros Reservoir Vicinity



LEGEND
 ■ = Primary periods of availability
 ▨ = Secondary periods of availability

Adapted from Simons 1982.

Bay Area. As a result of this observation, the CCTS was reduced to a general, temporary framework.

Ragir (1972) dealt with the drawbacks of the CCTS in her reevaluation of the Early Horizon by renaming the time-oriented Early, Middle, and Late Horizons Windmill, Cosumnes, and Hotchkiss, respectively, after the localities where the distinct cultural manifestations were best represented. In doing so, she gave more significance to the location of the site and the cultural materials observed than to the time period they (presumably) represented.

Along the same lines, Bennyhoff divided central California into local districts (e.g., Cosumnes, Colusa, and Diablo), which put further emphasis on geographic location rather than period (Elssasser 1978). Fredrickson, in collaboration with Bennyhoff, continued this trend by replacing horizon with the term "pattern", described as "an adaptive mode extending across one or more regions, characterized by particular technological skills and devices, and particular economic modes" (Fredrickson 1973).

Fredrickson's synthesis of culture histories from the Delta, Bay Area, and north Coast Ranges, based largely on his observations of adaptive behavior, was an outgrowth of this concept (Fredrickson 1973, 1974a). While some researchers have applauded Fredrickson's attempt to integrate cultural sequences in California, others (Gerow 1974, King 1974) have questioned Fredrickson's interpretations of the data used to support his regional chronology. King (1974) has argued that Fredrickson's use of evolutionary terms such as Paleo-Indian Period; Lower, Middle, and Upper Archaic Periods; and Upper and Lower Emergent Periods to create a temporally integrative scheme makes the distinction between simple temporal sequences based on key cultural traits and explication of the processes underlying socio-cultural change unclear. Figure 6 illustrates the different chronological sequences proposed for central California including Fredrickson's sequence of socio-cultural integration set forth in a temporal framework. Regionwide application of such a heuristic device awaits further research.

When viewed as a hypothesis, Fredrickson's model for the Los Vaqueros Project offers many avenues through which to address important research issues in central California. The Los Vaqueros Project area, because of its intermediate location between regions with established cultural sequences, may provide data that address the applicability of a regional chronology.

Previous Archeological Investigations in the Region

An archival review of the files of the Northwest Information Center (NWIC) at SSU was performed for 23 U.S. Geological Survey quadrangles in the project vicinity (Figure 7). Before the current study, the Los Vaqueros area has been subjected to extensive archeological reconnaissance; however, only two sites, CA-CCo-310 and -417, have been excavated within the project area and the results of both studies have not been published. Virtually

Figure 6. Concordance of Central California Archeological Sequences

Dates	Fredrickson (1973)	Heizer (1949)	Heizer and Cook (1949)	Bennyhoff and Heizer, in Heizer (1958b)	Heizer (1964)	Bennyhoff, in Fredrickson (1968)	Ragir (1972)	Fredrickson (1974)
A.D. 1880	Historic	Phase III 1800- Phase II 1700	Late Horizon	Phase 2	Late Horizon	American Period 1850- Sutter Period 1839- Mission Period 1769-	Hotchkiss Culture	Augustine Pattern (Hollister Aspect)
1500	Upper Emergent	Late Horizon		Late Phase 1 Middle Phase 1				
500	Lower Emergent	Phase I 500		Early Phase 1		Phase 1d 1100- Phase 1c 700 - Phase 1b 300-		
B.C. 0	Upper Emergent	Middle Horizon	Middle Horizon	Middle Horizon	Middle Horizon	Phase 1a Middle-Late Transition	Cosumnes Culture	Berkeley Pattern (Morse Aspect)
500	Middle Archaic							
1000								
1500								
2000		Early Horizon						
2500	Lower Archaic	Early Horizon	Early Horizon	Early Horizon	(not considered)	Windmill Culture	Windmill Pattern	
3000								
3500								
4000								
4500								
5000								
5500								
6000								

Adapted from Moratto 1984, Fredrickson 1973.

C-075601

**Figure 7. Archeological Work
Conducted in the Los Vaqueros Reservoir Vicinity**

USGS Quadrangle	Site Excavated	Reference (Comment)
Honker Bay	None	—
Antioch	None	—
Jersey Island	None	—
Briones Valley	None	—
Walnut Creek	CCo-431 CCo-236	Banks et al. 1984 Baker 1987
Clayton	CCo-222 (Keller Ranch) CCo-312/313	Holman et al. 1982 (Excavations by Hayward State, reported in Baker 1991)
Antioch 5	CCo-386 CCo-385	King 1979 (minimal excavation) King 1979 (believed surficial)
Brentwood	CCo-368 CCo-138	Miller, Rudo, and Rueve 1977 (two burials only) Lillard, Heizer & Fenenga 1939
Woodward Island	None	—
Las Trampas Ridge	CCo-30 (La Serena) CCo-308 (Stone Valley) CCo-309 (Rossmoor) CCo-311	Fredrickson 1965, 1968; Pastron 1979 Fredrickson 1965, 1966 Fredrickson 1965 Moss and Mead 1967 (minimal salvage)
Diablo	CCo-352	Fredrickson 1975
Tassajara	None	—
Byron Hot Springs	None	(Excavations by Hayward State, re- ported in Fredrickson et al. 1966)
Clifton Court Forebay	None	—
Dublin	Ala-413	Wiberg 1984 (full site never reported)
Livermore	Ala-394 Ala-44	Parkman 1977 (full site never reported) Banks 1978 (minimal report)
Altamont	Ala-28	McGeein and McGeein 1957
Midway	None	—
Niles	Ala-343	Roop et al. 1981, Hall et al. 1985 (closer to Bay Region)
LaCosta Valley	Ala-428/H	Leventhal et al. 1989
Mendenhall Springs	None	—
Cedar Mountain	None	—
Lone Tree Creek	None	—

no archeological excavation has been performed near the project area or vicinity, and the work that has been conducted has gone unreported.

In the region, however, many archeological sites have been excavated. Excavation projects have been dispersed and were primarily of small scale. Reports were located for excavations at 17 archeological sites within this area; several other sites (CA-CCo-31, -138, -312, and -313) are known to have been excavated, but the reports were not available. Concentrated investigations of watersheds or other geographic units have not been performed.

Fredrickson's work at CA-CCo-30, -308 and -309 (Fredrickson 1965, 1966), augmented by work by Moss and Mead at CA-CCo-311 (1967) and Pastron at CA-CCo-30 (1979) represents the most concentrated subsurface investigation in the project region. CA-CCo-30, -308, and -309 all lie within the San Ramon Creek watershed, in the Alamo vicinity. In 1965, Fredrickson interpreted the sites as representative of five temporal components with reference to the CCTS (Heizer 1949), which was the predominant chronological and topological scheme at that time (Figure 8). In this interpretation, the sites represented a continuum from early Middle Horizon in the lower stratum of CA-CCo-308 (radiocarbon dated to $4,450 \pm 400$ years B.P.) to Phase II Late Horizon at CA-CCo-309 (a single-component site radiocarbon dated 285 ± 95 years B.P.). Chronologically, CA-CCo-30, a two-component site, was placed between CA-CCo-308 and -309, with a Middle Horizon component and a Phase I Late Horizon component. Pastron's (1979) excavation at CA-CCo-30 confirmed these two components. CA-CCo-308 also contained a mid-Middle Horizon component and a component identified as representing a Transition Phase between the Late-Middle and Phase I Late Horizon. This Transition Phase, estimated to date from 0 A.D. to 300 A.D., was also identified at CA-CCo-20 and -250 in the Diablo locality and at CA-Ala-290 and -309 in the San Francisco Bay region (reports not located).

A report on the small salvage excavation at CA-CCo-311 (Moss and Mead 1967) was inconclusive about chronology and affiliation; however, since the report was published, the site has been identified as representing a Meganos intrusion dating to before the Middle Horizon/Late Transition Phase (Fredrickson pers. comm.). The site contained both flexed and extended burials. *Olivella* beads of unspecified types, round and rectangular *Haliotis* ornaments, and chert, quartz, and obsidian projectile points, including 13 chert specimens described as "ceremonial" were reported in association with burials. CA-CCo-31 in Pleasant Hill, which contained extended burials, was assigned by Bennyhoff to the Meganos Aspect and was considered contemporaneous with CA-CCo-311 based on bead co-occurrences (Fredrickson pers. comm.).

In the Diablo quadrangle, west of Los Vaqueros, CA-CCo-352 was sampled by Fredrickson in 1975. CA-CCo-352 was interpreted as a habitation, activity, and cemetery site. Residents are believed to have maintained exchange relationships to import obsidian from Napa and shellfish from the bayshore. Fredrickson assigned the site to Phase I of the Late Horizon (ca. 700 A.D. to 1100 A.D.), with continuing occupation into Phase II of the Late Horizon.

In Fredrickson's 1965 interpretation, the culture of the Diablo locality during the Middle Horizon was dominated by inland adaptations and Central Valley/Delta patterns.

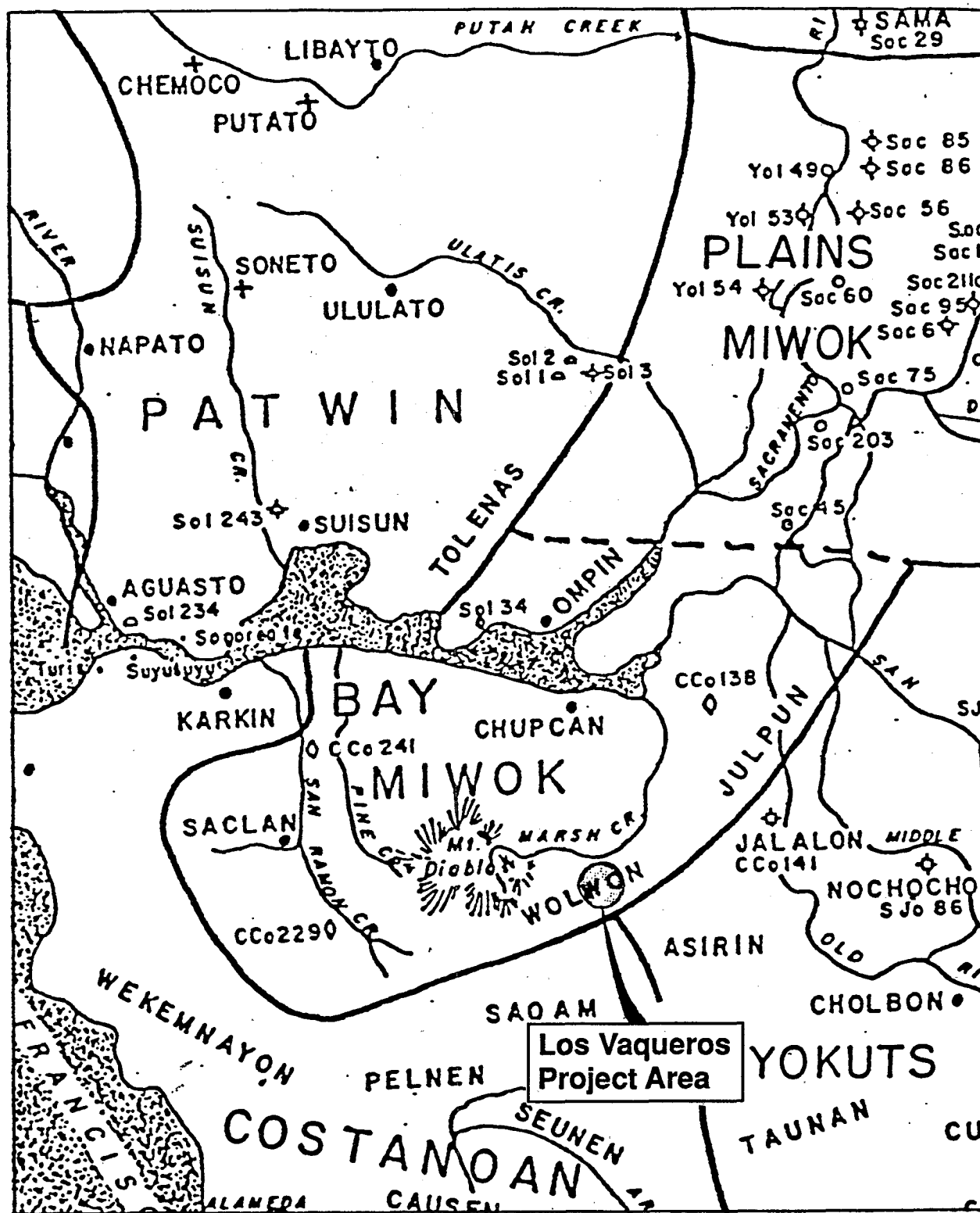


Figure 8. Ethnographic Linguistic Groups and Tribelet Locations

Source: Bennyhoff 1977

The Transition Phase, during which there was a significant increase in the use of marine mollusks (by a factor of 15-20 times) compared to both preceding and subsequent periods, represents an immigration to interior Contra Costa County of a people adapted to a bayshore economy. The following Phase I Late Horizon shows a group fully adapted to the inland environment. Also noted during the Transition Phase was an increase in imported obsidian (this trend continued and accelerated in the Phase I Late Horizon as seen at CA-CCo-30), a paucity of local lithic materials other than chert, and greater use of imported foods. Fredrickson interpreted these changes as representing population movement, rather than diffusion.

The three sites represent intermittent occupation over 4,000 years. The earliest group shared traits of the Early and Middle Horizon. A tentative mid-Middle Horizon component was also delineated. Cultural affiliation during the Middle Horizon is believed to be with the Sacramento Valley with some influence from the Napa Valley. This may have been followed by a time (not manifest at CA-CCo-30, -308, -309) when influences of the northern San Joaquin Valley were manifest in the Diablo locality. Beginning with the Transition Phase, cultural influences of the Bay region are interpreted to represent an influx of a bayshore-oriented population. Phases I and II of the Late Horizon artifact assemblages in interior Contra Costa County give the impression of affiliations with the Late Horizon in the lower Sacramento Valley, along with certain characteristic Delta elements. However, interior Contra Costa County groups may not have participated in the ceremonial life of populations of the Sacramento Valley or may have participated in such ceremonies in attenuated form.

Fredrickson had refined his interpretation of CA-CCo-308 chronology by 1977, and had assessed the deepest component of the site as representing the Berkeley Pattern, which was seen as contemporaneous with the Windmill Pattern of the Sacramento Valley (Fredrickson 1977a). He also noted that the lowest component of CA-CCo-308 had cultural material under as much as 22 feet of sterile alluvium. Radiocarbon dates of $4,450 \pm 400$ B.P., $3,125 \pm 230$ B.P., and $2,870 \pm 335$ B.P. were reported for the lowest component of CA-CCo-308. A date of $3,000 \pm 200$ B.P. may be most accurate (Banks et al. 1984). Later radiocarbon assessment of samples from the middle component of CA-CCo-308 yielded additional dates of $1,250 \pm 230$ B.P. and $2,860 \pm 120$ B.P., while the upper most component yielded dates of 470 ± 120 B.P., 865 ± 50 B.P., 940 ± 50 B.P., 980 ± 50 B.P., and 1185 ± 125 B.P. Additional assessments for CA-CCo-30 (upper component) ranged from 265 to 585 ± 50 B.P. CA-CCo-309 yielded a date of 285 ± 50 B.P. (Fredrickson 1980.)

B.P.
^

Northwestward, in the Walnut Creek area, Banks and colleagues excavated at CA-CCo-431 in 1979 (Banks et al. 1984). The site, a buried deposit, appeared to be a sparse cultural deposit, possibly at the margin of a more intensively occupied site. Obsidian hydration suggested occupation dating to 1,200-2,300 years ago. Three buried surfaces were noted; the middle of these was radiocarbon dated as younger than $2,870 \pm 120$ B.P. The cultural affiliation of the site would be the Alamo Phase of the early Berkeley Pattern of the Concord Phase of the Windmill/Berkeley Transition. Trade interactions with Napa Glass Mountain area are indicated; whether other sources were used is unknown. Trade for chert from a Monterey source is also suggested.

CA-CCo-236, in Lafayette, was excavated by Baker in 1987. Virtually all time-sensitive artifacts from this site, including clam shell and *Olivella* lipped beads and small (Type 1) projectile points, indicate that this site was occupied principally during the latter part of the Augustine Pattern (Phase II of the Late Horizon), dating from about 1500 A.D. to the late 1700s. Heavy use of imported obsidian as raw material, near-complete exclusion of chert, and the predominance of clam shells over mussel shells also indicate late use of the site. Mortars, pestles, and small arrow points suggestive of bow and arrow use were also recovered. Raptor remains could suggest participation in the Kuksu Cult. Evidence of extensive trade networks is noted. Banks et al. (1984) present chronological correlations for the Diablo District based on the excavations summarized here and elsewhere.

Somewhat closer to the project area is CA-Ala-413, the Santa Rita Village site, near Pleasanton. Sixty-four burials excavated from the site in 1978 were analyzed by Wiberg (1984a) as manifestations of a Meganos intrusion. Wiberg did not describe artifacts in detail or prepare an artifact typology. The Meganos Aspect, first identified in the northern San Joaquin Valley, was described by Bennyhoff (1968) as a merging of Windmill Pattern and Berkeley Pattern elements. A brief expansion of this culture into the Diablo and Alameda Districts between the end of the Middle Horizon and the Middle Horizon/Late Augustine Horizon transition is suggested by Bennyhoff (Wiberg 1984a). This would correlate with the cultural component described for CA-CCo-31 and -311, above. Wiberg writes that two alternative dating schemes for the central California archeological sequence date this Meganos intrusion at 300 B.C.-100 A.D., or 500-700 A.D. (Fredrickson 1980). Wiberg argues that the Meganos culture was more widespread and longer lasting than previously thought.

Wiberg distinguished two components at CA-Ala-413. The lower component, radiocarbon dated between 400 B.C. and 200 A.D., is characterized by flexed burials with few artifacts. Some extended burials occur at the same level as the flexed burials or below the flexed burials. Wiberg identifies the upper component of the site as a possible Meganos intrusion. Radiocarbon dates indicate that the upper component pattern commenced after 100 A.D. and lasted until 500 A.D. or later. It is defined by exclusively extended burials, northerly burial orientation, and abundant grave associations, including thousands of shell beads and other shell artifacts, quartz crystals, charmstones, and other nonutilitarian grave goods.

Bennyhoff defined the Meganos Aspect on the basis of mixed flexed and extended burials, the latter predominating and interpreted as a Windmill trait, along with a low yield of associated artifacts, a Berkeley Pattern characteristic. Other traits of Bennyhoff's Meganos Aspect are an underdeveloped ceremonial system and a relatively undeveloped exchange network. In contrast, at CA-Ala-13, the extended upper component burials had rich, frequently ceremonial associations, more like classic Windmill sites. Exchange networks and ceremonial systems appear well developed. Wiberg suggests that the Meganos Aspect, as seen in the upper component at CA-Ala-413, represents a survival of the Windmill culture. He speculates that the Windmill traits surviving from the lower Sacramento Valley could be maintained at CA-Ala-413 because of the residents' political position, gained through local exchange networks.

Clearly, much more extensive investigation will be required to clearly define chronology and cultural patterns in this area. The cultural affiliations defined by Wiberg must await confirmation by analysis of the full CA-Ala-413 assemblage. Little has been reported regarding the artifacts themselves, although Wiberg's illustrations include rectangular and round *Haliotis* ornaments and very large (12- to 17-cm long) obsidian and chert blades.

Ca-CCo-222, located northwest of the project area in Clayton Valley, was excavated by Holman and Associates in 1982. Holman suggested the possibility of a Berkeley Pattern component for the lower part of the site, with an upper more extensive and better represented Augustine Pattern component. These San Francisco Bay region patterns roughly equate with Early and Late Horizons of the Sacramento Valley or with Fredrickson's (1974a) Middle Archaic and Emergent Periods. Supportive of the Augustine Pattern are a clam shell disk bead, obsidian projectile point fragments of late types, a sandstone discoidal similar to late Alameda District and Diablo District specimens, shaped mortar fragments, and shaped pestles. The primarily Napa Glass Mountain obsidian sources tend to conform to the patterns established at other late interior sites. Shell is relatively rare; only two shell artifacts were recovered. There is no direct evidence the Meganos Aspect in the portion of the site excavated. However, a Berkeley Pattern Middle Horizon affiliation for the lowest level of the site is suggested by a radiocarbon date of $2,820 \pm 120$ B.P., and a single basalt point fragment and a expanding stem point made of chert. This sample came from a flexed burial that had an associated large leaf-shaped obsidian biface from a Napa Glass Mountain source. The upper component yielded a radiocarbon date of $1,600 \pm 200$ B.P., too early to represent Phase II of the Augustine Pattern evident in other areas of the site. Horizontal stratification may occur at the site, and although the cultural chronology of this site is not clear, at least some portion of the site probably represents the Phase II Late Horizon (Augustine Pattern).

Another site or site complex in the Clayton vicinity, CA-Ala-312/313, was excavated by California State University, Hayward in 1969 (no report is available). At least 1,000 artifacts and 15 burials were recovered. Artifacts indicate that "occupation began during the initial stages of Phase I Late Horizon (c. 700 A.D. to 1000 A.D.) and terminated after the introduction of desert side-notched points, Ca. 1450 A.D." (reported in Baker 1991). No other information is available at NWIC regarding this assemblage.

Near Antioch, two sites, CA-CCo-385 and -386, were excavated by King in 1979. King postulates settlement at CA-CCo-386 before 1000 A.D., based on the absence of late-period artifacts and the presence of many fragments and obsidian flakes "retouched from large knives" (1979). Features included hearths and pits. Few additional data were presented. CA-CCo-386 was viewed as a habitation site; CA-CCo-385 was viewed as an activity area.

Eastward into the Delta, two burials were salvaged in 1977 from CA-CCo-368 on the Hotchkiss tract. One was extended on its side, the other flexed ventrally. A bowl mortar was associated with one burial. The site, a midden deposit on a Delta sandhill, was assumed to be of the ethnographic period, based on the presence of dark midden rather than the typical "burial island" sand mound of earlier types in the Delta (Miller et al. 1977).

South of the project vicinity, near Altamont, McGeein and McGeein excavated at CA-Ala-28 in 1957. Nine house pits in a dark gray midden were recorded. Only 53 artifacts were recovered from over 50 cubic yards of excavated material. The assemblage included hopper mortars; bone awls; bird bone tubes; scapula saws; *Haliotis* ornament fragments; *Olivella* beads; large obsidian and chert projectile points; and chert, chalcedony, and quartz blades. Two burials were uncovered: one the remains of a tightly flexed infant, the other fragments of an adult. On the basis of the faunal assemblage, which included a variety of fish and animal bone, the site was postulated to have been occupied during late fall, winter, and early spring and was believed to date to the precontact Late Horizon.

West of this site, within the Livermore quadrangle, Parkman excavated at CA-Ala-394 in 1974. A letter regarding field notes from the site reports that the site, deeply buried by alluvium, "was low yield in nature" (Parkman 1977). Five extended and one flexed burial were reportedly excavated from the site vicinity by local residents. Numerous scrapers and other chert and obsidian tools, a bone awl, and a bird bone tube were recovered. Parkman postulated that the site was an early Middle Horizon or late Early Horizon deposit. Fredrickson (1977b) examined the notes and came to a similar conclusion, although he noted that more current terminology would equate Early Horizon with the Windmill Pattern, Middle Horizon with the Berkeley Pattern, and Late Horizon with the Augustine Pattern and that he would assess the site as belonging to the Berkeley Pattern.

South of the Pleasanton site, Leventhal et al. excavated at CA-Ala-428/H in the Sunol Regional Wilderness. Leventhal assigns the site to the Middle Period in dating scheme B1 of Bennyhoff and Hughes (1987) and believes that the site predates 900 A.D. This chronological assignment is based on large projectile points classified as dart points (rather than arrow points). Mortars and pestles from the site are unshaped, and two manos (but no metates) were noted. One clam shell disc bead, a Late Horizon Phase I or Augustine time marker, was collected from the surface. Six of seven obsidian pieces collected were identified to be from Napa; a seventh specimen may have come from east of the Sierra. Radiocarbon dates did not confirm this assignment: four dates, all on samples that were somewhat suspect, included modern, 1507 A.D., 1409 A.D., and 982 A.D., obsidian hydration-derived dates that were not consistent with radiocarbon dates.

Data from these sites are presented to contribute to hypothesis formulation for the Los Vaqueros area. Correlation of these regional chronological signatures with the Los Vaqueros area is one of the main research topics discussed below under "Theoretical Orientation for Prehistoric Archeology".

ETHNOGRAPHIC SETTING

The project area is situated at the interface of four different ethnolinguistic groups that used the region before European contact: the Bay Miwok, the Northern Valley Yokuts, the Ohlone, and the Plains Miwok. Because direct ethnographic accounts were not recorded for the project area and its vicinity, and because historical information is limited and often contradictory, mission records have been used extensively in the past several years for

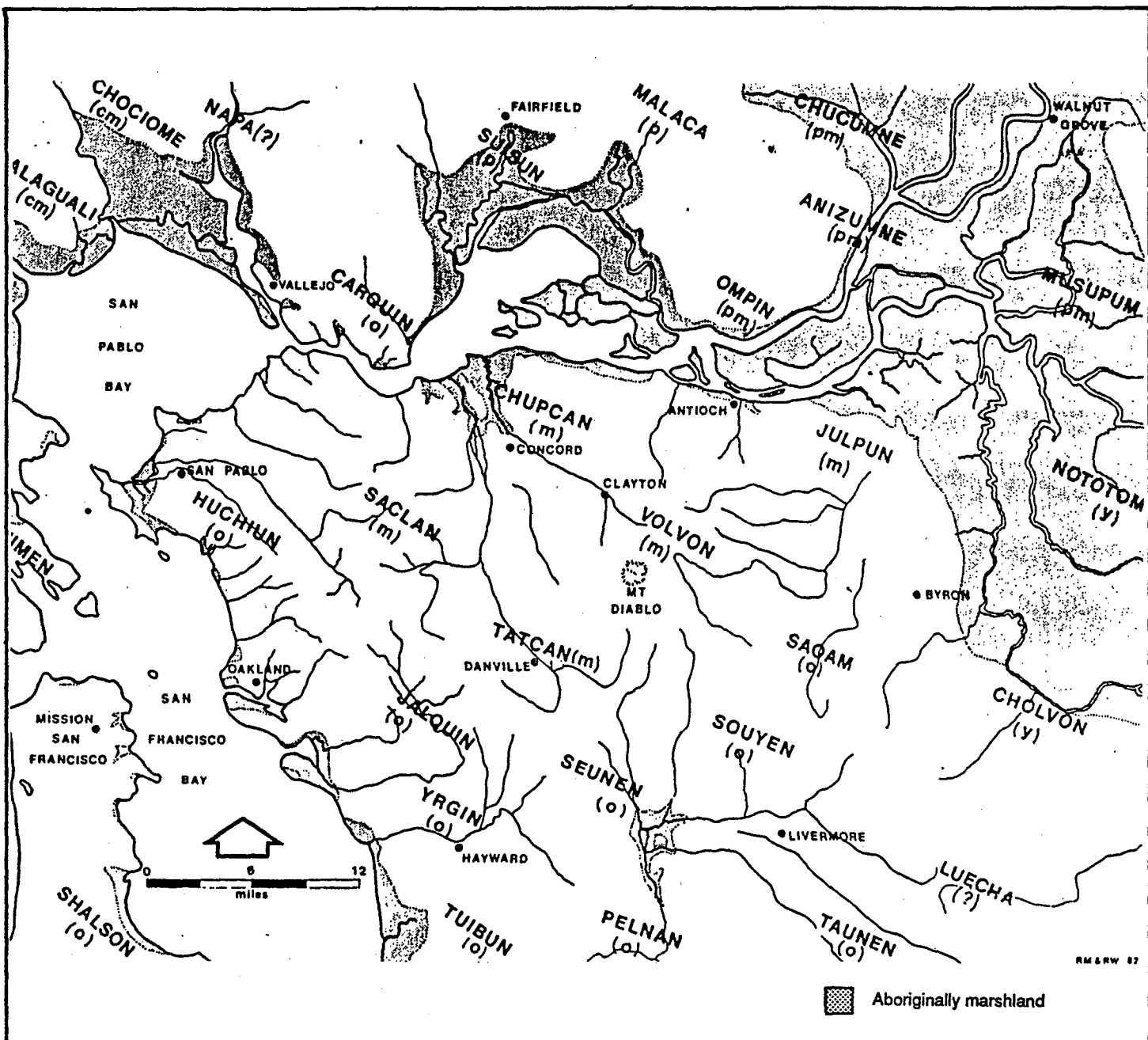
information pertaining to ethnolinguistics and ethnogeography (e.g., Callaghan 1982, Milliken 1982). Callaghan (1982), based on her analysis of forms of personal names contained in the mission records and drawing from the work of Bennyhoff (1977) and Milliken (1982) concluded:

The Los Vaqueros area may well have been jointly occupied by several tribelets representing different linguistic groups. If it was inhabited by a single group, I consider the Volvon [Wolwon] to be the most likely candidates. I would rank the Saoan [Saoam] as the second most probable occupants, and the Julpun the third. Other groups, such as the Jalalon Yokuts, are remote possibilities.

Milliken (1982) presented some of the results of his study of mission records and other historical documents in a report pertaining to the Clayton area of Contra Costa County, including a map that extends eastward into the western margin of the Delta. Like Callaghan, Milliken (1982) noted that the exact territories of the ethnolinguistic groups that inhabited the area around Mt. Diablo cannot be precisely located. However, using principles of circumstantial evidence that he developed, Milliken established sets of social and spatial relationships between different communities that enabled him to map the locations of their likely homelands; these locations are subject to change as new data become available. Milliken's (1982) reconstruction, differing in some respects from Bennyhoff's reconstruction (Figure 9), places the Kellogg Creek drainage within territory of the Ohlone-speaking Saoam, with the Bay Miwok-speaking Volvon placed to the northeast of Mt. Diablo and the Bay Miwok-speaking Julpun in the vicinity of Brentwood (Figure 10).

For several reasons, however, Callaghan prefers Bennyhoff's placement of Volvon within the Marsh Creek watershed, west of Mt. Diablo. Thus, according to current ethnolinguistic reconstructions, the reservoir portion of the Los Vaqueros Project area was most likely within either Volvon or Saoam territory and the northern flatlands of the project area were within Julpun territory. Ohlone from the Livermore Valley may have used the project area because it is near the marshland resources of the Delta. A route from the Livermore Valley following Kellogg Creek would have provided a shorter journey to such resources than one through Altamont Pass.

Although no published ethnographic information pertaining to the study area or its vicinity is available, generalizations about lifeways can be derived from information for better known, surrounding groups. Simons (1982) developed a model of prehistoric human adaptations for application within the present project area, basing it on ethnographic and archeological data known for closely related cultures. Based on this model and on the observation that no large permanent villages have been identified in the project area, Simons hypothesized that the upper Kellogg Creek watershed served local populations primarily as a seasonal resource procurement zone. Simons' model is offered here as a hypothesis to be tested. The absence of a large permanent village site within the project area would not preclude year-round exploitation of the Los Vaqueros watershed by Native Americans.



Tentative locations of Native American tribelets within a 30-mile radius of Mt. Diablo at the beginning of the 19th century. Letters in parentheses indicate linguistic affiliation (cm - Coast Miwok, m - Bay Miwok, pm - Plains Miwok, o - Ohlone, p - Patwin, y - Yokuts). Some modern cities added for reference.

Figure 9. Native American Tribelets in Contra Costa County

Source: Milliken 1986

**Figure 10. Key Artifact Types and Traits and Their Postulated
Chronological Placement Observed at Sites in the Vicinity of Los Vaqueros Reservoir**

Site/Component	Chronological Placement	Period	Artifact/Trait
CA-CCo-309 (single component)	C_{14} 285 ± 95 B.P.	Late Horizon Phase II	Clam shell disc, lipped Olivella, and steatite disc beads; shaped stone pestles and bedrock mortars; cremations and flexed burials; small chert obsidian serrated and corner-notched projectile points; obsidian debitage continues; few glass trade beads; apparently no Kuksu cult
CA-CCo-30 (upper component)	Mid to Late Phase I C. 700 A.D. - 1500 A.D.	Late Horizon Phase I	Thin rectangular olivella beads; Haliotis ornaments; many obsidian projectile points; unassociated artifacts resembling Delta and lower Sacramento Valley types are abundant; bird bone whistles; tubular stone pipes; flexed burials with few grave goods and rich cremations interpreted as status differentiation; obsidian debitage increased compared to Middle Horizon; no indications of Kuksu cult although many similarities in other material culture
CA-CCo-20, -250, -308 (upper stratum), CA-CCo-290, -309	C. 0-300 A.D.	Transition Phase	Thin rectangular, split, and split rectanguloid Olivella beads; rectanguloid Haliotis ornaments with multiple end perforations; large scalloped projectile points; dressed mortars with incurving sides; Bay area type and Napa Valley type scapula saw with axillary border removed; marked increase in shell (compared to both Early Late Horizon and Late Middle Horizon); obsidian shouldered lanceolate projectile points; local lithics dominated by chert; obsidian debitage rare.
CA-CCo-31 and CA-CCo-311	No date obtained from sites	Late Middle Horizon	"Late Middle Horizon shell beads"; dorsally extended and flexed burials; large well-made chert projectile points; dominance of area by northern San Joaquin Valley cultures suggested
CA-CCo-308 (middle stratum)	C. 700 B.C.	Mid-Middle Horizon	Mostly stemmed projectile points; high concentrations of bone artifacts; flexed burials; scraper planes possibly indicate vegetal processing; grizzly bear ceremonialism;
CA-CCo-308 (lower stratum)	C_{14} 4450 ± 400 B.P.	Early Middle Horizon	Stemmed projectile points; low concentration of bone artifacts; flexed burials
No information before Early Middle Horizon			
Note: Not all time periods are represented.			

Milliken (1982, 1986) describes the early history of the project area and its environs after initial Spanish contact and before the American pioneer period. The Spanish first entered eastern Contra Costa County in 1772 when Pedro Fages led a small exploratory party into the Concord region over Willow Pass and into the West Pittsburg vicinity before returning to Monterey. In 1776, another party under the leadership of Juan de Anza camped near Concord then traveled through Antioch and the plains of eastern Contra Costa County toward Tracy, eventually turning westward to Monterey over the south Coast Ranges. Later the same year, Spaniards established an army garrison and mission in San Francisco; although Moraga led another party over Altamont Pass and explored the San Joaquin Valley, it is unlikely that they entered the study area.

According to Milliken (1986), there is no record of Spanish troops east of Mt. Diablo between 1778 and 1806 when the local Native American tribes of the Bay Area "were conquered and brought to Mission San Francisco". Soams from eastern Livermore Valley and possibly the headwaters of Kellogg Creek arrived at Mission San Jose in 1803. Although the first Volvon individual was also baptized at Mission San Jose in 1803, it was not until 1805 that groups of Volvon first appeared at both Mission San Francisco and Mission San Jose; all but two Volvon baptisms occurred before 1807. Milliken (1982) also reports that between 1803 and 1806 the Volvon were one of the east Bay Native American tribes that actively resisted the Spanish, prompting retaliatory military forays ending the resistance by forcefully rounding up the Volvons and bringing them to the missions.

Between 1806 and 1811, several Spanish expeditions entered the San Joaquin Valley, visiting Indian communities along the waterways. Milliken (1986) states that the river-dwelling tribes of eastern Contra Costa County were taken to Mission San Jose between 1810 and 1812. He writes that "from that time until 1836, eastern Contra Costa County seems to have been virtually uninhabited."

After the missions closed in 1834-1836, the project area was included in the Rancho Los Meganos land granted to Jose Noriega in 1835, which originally included the entire watersheds of Marsh and Kellogg Creeks. In 1838, Noriega sold the rancho to John Marsh, and in 1844 the southern portion of the rancho, including the majority of the Kellogg Creek watershed, was ceded to Francisco Alviso, Antonio Hiquera, and Manuel Miranda as the Rancho Canada de los Vaqueros (Milliken 1986). According to Milliken (1986), Marsh's labor force consisted of Julpun and Volvon Native Americans recently returned from Mission San Jose; Alviso employed Native American vaqueros who lived on the land and herded the cattle. Villa and Dutschke (1982), pointing out that Marsh and John Sutter exchanged Native American laborers at certain times of the year to plant and harvest crops, suggested that this relationship could have influenced the movement of Native Americans from the Livermore-Pleasanton area to Ione and other Sierran foothill communities. They also state that several Native Americans who live in Ione were originally from the Pleasanton-Livermore area, and heritage ties to that area still exist.

CULTURAL CONTEXT FOR HISTORIC ARCHEOLOGY

As discussed below for the theoretical orientation for historical archeology, it is necessary to understand the historical context to determine the importance of historic-period resources, especially within the framework of a district. The following provides the historical context statement and supporting data for the project area.

Los Vaqueros Uplands Ranching Adaptations: 1835-1945

Between 1834 and 1846, more than 800 patents of land, constituting more than 12 million acres, were issued to individuals by the Mexican government in what is now California (Lavender 1976). Sixteen of the final 813 grants were in present-day Contra Costa County (Beck and Haase 1988). The lands granted by the Mexican government were known as ranchos. Under the rancho system, land outside of towns was considered valuable only for grazing purposes; thus, any citizen of good character with cattle and funds for fees and taxes could get a grant for a grazing tract. Grantees were required to submit a diseno (a description and map) of the area they desired. The rancho boundaries marked on the disenos were usually vague and indicated only by major landmarks.

Francisco Alviso, Antonio Hiquera, and Manuel Miranda (three brothers-in-law) were awarded Canada de Los Vaqueros (Valley of the Cowboys) on February 29, 1844. Three years before being granted the land, Alviso had already built a large corral and stocked his ranch with livestock. The three grantees probably did not reside full time at Los Vaqueros; they did, however, take an active role in supervising the Californios and Native Americans in their employ. These employees lived in a wooden house on the ranch (Land Case 79:7-19).

Stock raising was the main economic pursuit during the Mexican period. Land was not developed for agricultural purposes more intensive than subsistence-level farming. With a relatively sparse and scattered population and a poor transportation system, commercial agriculture was not economically feasible during this period in most locales. Because ranchos were not fenced, cattle and other stock roamed at will and mixed with stock owned by neighboring rancheros. At least once a year a rodeo was held and each rancho herded his own stock back to his land. Los Vaqueros reportedly contained a rodeo site (DeNier 1928).

The first building erected on a rancho was usually of either wattle or palizada construction. Palizadas were easily constructed log buildings chinked with mud and tules that served to prove a claimant's intention to settle. More permanent adobe structures were usually constructed after the land claim was confirmed.

On July 7, 1846, following the declaration of war between the United States and Mexico, Commander Sloat claimed California for the United States catalyzing a minor influx of Americans to California. When the first Americans arrived, Mexican livestock grants

covered most of the best land, curbing settlement. The prior claim of the Mexican grantees, however, did not stop the influx of immigrants, and many squatters eventually appeared throughout the county following the announcement of the California goldfields in 1848 (Smith and Elliot 1879). Many gold rush immigrants sought land to take up ranching and farming.

Mexican land grants were written giving the boundaries of one claim as that of another; Los Meganos, for example, was described as being bordered by Los Vaqueros to the south. As finalized by the U.S. Land Commission, these grants often contained much less land than that originally described; the land grants became surrounded by public land that could be settled and purchased from the General Land Office.

In 1847, Alviso and Miranda sold their interests in Los Vaqueros to Noriega and Livermore, who also owned the Rancho Los Positas to the south (Land Case 79:41). Livermore and Noriega filed a claim for Los Vaqueros and Los Positas in February 1852. Noriega also hired an attorney to settle his land problems. The attorney worked out an agreement whereby Livermore received Los Positas while the attorney and Noriega each received a half interest in Los Vaqueros. The attorney sold his half interest to William Akenhead, while Noriega sold to Maximo Fernandez. Akenhead lost his property because of an unpaid debt; Juan Sunol purchased it at a sheriff's sale. Both halves were sold in separate transactions on November 14, 1857: Lorenzo Sunol purchased a half interest from Fernandez, and Juan Baptiste Arrambide, Bernardo Altube, Bernard Ohaco, and Charles Garat purchased Juan Sunol's half from its current owner, Ellen Garat. These two owners lived on the rancho in 1860 and are listed on the census.

Lorenzo Sunol, a native of Spain, probably lived with his two laborers at the "upper adobe" (CCo-450/H) recorded by Hendry and Bowman (1940) and shown as "Sunal" on an 1873 map (California Geological Survey 1873). On the 1860 U.S. Census Agricultural schedule, Lorenzo "Senole" claimed 7,750 acres, of which only 2 acres were improved. Sunol used the land for cattle ranching. Arrambide, Altube, and Ohaco probably lived at the "lower adobe" (CCo-470H); Arrambide and Ohaco were French; Altube was Spanish. Altube's household included his French wife and daughter, Arrambide, three members of the Ohaco family, and four other persons of French, Spanish, and Native American descent. Of their 8,880 acres, only 5 acres were improved. The remaining acreage was used to graze 1,280 head of stock cattle and 50 horses worth \$17,750.

Although the U.S. Land Commission confirmed Robert Livermore's and Jose Noriega's claim to Los Vaqueros in 1855, and Livermore and Noriega refiled their former transaction deeding Los Vaqueros to Noriega, considerable confusion regarding the title to Los Vaqueros ensued when Livermore died in 1858. Livermore's wife and eight children claimed Los Vaqueros based on a deed to them predating the Noriega transfer (Deeds 2:156-157). Similarly, each of grantee Antonio Higuera's four children inherited one-quarter of their father's interest, which was said to be one-third of the entire rancho (Deeds 8:160); the remaining two-thirds were claimed by Alviso and Miranda. Meanwhile, Lorenzo Sunol and Arrambide, Altube, and Ohaco each claimed a half interest and resided on the rancho.

By about 1860, various parties held deeded interests totaling over 200% of the Los Vaqueros rancho, half of these claims being in the hands of Livermore's heirs and Noriega's assignees and the rest held by descendants of the 1844 grantees. Arrambide, Altube, and Ohaco sold their half-interest to a San Franciscan in 1863, who quickly transferred the property to Louis Peres and Pedro Altube, whose relationship to Bernardo Altube is unknown. Peres and Altube also purchased the interests Alviso and of eight of Livermore's heirs. When Altube sold his interest to Peres in 1880, it purported to cover the entire 17,752-acre rancho (Deeds 39:282). During the same period, a wealthy Martinez family, the Blums, bought out Miranda and Higuera's heirs.

In 1881, a mortgage taken out on Los Vaqueros by Peres and Altube was approaching foreclosure. At that time, the interests in the rancho that had been sold to Peres and Altube and Blum were broached and a settlement suggested by the mortgage holder who had purchased Akenhead's interest to the property at a probate sale in 1868 (Deeds 15:428), despite the sale by Sheriff's Deed of this same property more than 10 years before (Deeds 5:196). Peres' and Altube's mortgage "purported to cover the entire Rancho Canada de Los Vaqueros, whereas Simon Blum claims title as owner of two thirds of said Rancho" (Deeds 39:425). In 1881, Peres sold his claim to Charles McLaughlin, and in 1889 Blum sold his interest to Mary Crocker, McLaughlin's heir (Fredrickson 1982). Other claimants, including Lorenzo Sunol, continued to contest Blum's claim until the issue was settled in court in 1889 (Deeds 57:356, Patents 4:124).

The public land surrounding Los Vaqueros was surveyed in the 1860s and 1870s, opening the area to permanent settlement. An individual could obtain a maximum of 320 acres from the federal government, a very small holding in comparison with the thousands of acres that made up neighboring Mexican land grants. It was not until the early 1870s that patentees filed claims to government land in the Los Vaqueros uplands, using a combination of homestead and cash entry patents to obtain small 320-acre ranches (e.g., CA-CCo-562H and -563H). These settlers were predominantly Californios and Mexican immigrants. Many of these families lived on their land through 1880 but disappeared from the area by 1900. Although some of the Californio-Mexican population remained in 1900, recent immigrants from the Azores now resided in the former public land within the project area. The parcels of the original patentees generally had not been consolidated, but the Azorian ranchers owned or leased many noncontiguous 160- to 320-acre parcels to form larger holdings.

A third factor entered into the disposition of land in the Los Vaqueros uplands. In 1862 and 1864, Congress passed acts to aid construction of a railroad and telegraph line from the Missouri River to the Pacific Coast. The Western Pacific Railroad was promised:

every alternate section of Public Land designated by odd numbers to the amount of ten alternate sections per mile on each side of said Railroad on the line thereof, and within the limits of twenty miles on each side of said road, not sold, reserved or other disposed of by the United States, and to which a Preemption or Homestead claim may not have been attached at the time the line of said road is definitely fixed (Patent 1:237).

On February 1, 1870, it was reported that the telegraph line and railroad had been completed and equipped, and Charles McLaughlin, land agent and contractor for the Western Pacific Railroad, selected 111,527.57 acres of public land (Patent 1:237-251), including many of the odd-numbered sections within the study area.

McLaughlin subcontracted a portion of his contract to Jerome B. Cox who never received full payment for his work. For 20 years, Cox fought McLaughlin in the courts. Each time a judgment awarded payment to Cox, McLaughlin's attorneys appealed and the decision was overturned. In frustration, poverty, and despair, Cox killed McLaughlin in 1883. Cox claimed self-defense with public opinion weighing so heavily in his favor that all charges were dropped at the preliminary hearing. At the time of his death, McLaughlin was the second largest landholder in California, following only Leland Stanford. Kate McLaughlin outlived her husband by 5 years and left the large estate to her two nieces Kate Dillon and Mary Crocker (Williams n.d.).

Meanwhile, the nature of stock raising was changing. During the Mexican period, cattle had been raised primarily for the hide and tallow trade because there was no market for large quantities of beef. The California gold rush, however, created a huge demand for meat, and the orientation of ranchers changed dramatically during 1850-1860. Improved cross-bred stock replaced the original Spanish breeds (Burcham 1957, 1961). The necessity of range improvements became immediately obvious when almost 2 million head of cattle perished in the floods of 1861-1862 and the subsequent drought of 1863-1864. The first range improvements occurred due to this demise, after which ranchers planted various forage crops as a supplement to the natural vegetation (Burcham 1975). In the 1870s, many ranchers began raising sheep, finding these animals better adapted to California's semi-arid climate (Burcham 1956, 1957, 1961).

Following the final resolution of Los Vaqueros title disputes in 1890, Mary Crocker divided the property into a greater number of ranches that she leased to tenants who practiced more intensive forms of stock raising. In 1929, Los Vaqueros was divided into 13 leased units (e.g., CA-CCo-426H and -569H). Many of these ranchers were immigrants from France, Italy, and Portugal. Some families continued their lease agreements on the property for over 30 years, passing them from parents to sons along with livestock and personal property on retiring (e.g., Miscellaneous Records 12:359). These tenant ranchers and the few surrounding owner-occupiers practiced mixed agriculture. They grew grain, wheat, and hay, and raised dairy or beef cattle herds, sheep, pigs, horses, and poultry. In 1924, for example, the Fragulia family owned approximately 60 cows, 27 horses, 150 sheep, and 25 pigs (Miscellaneous Records 12:359).

O. L. Starr purchased a 7,883-acre parcel from the Mary Crocker estate in 1935 (Official Records 396:16). At that time the Vasco Road property was leased by an Italian family who lived on the west side of Kellogg Creek. Starr built his complex nearby on the east side of the creek and the earlier ranch complex including the site of an 1850s adobe fell into ruins (CA-CCo-470H). Starr made many improvements, including a new ranch house, barns (CA-CCo-449/H, -450/H), and water systems (CA-CCo-451H, -467/H). Starr raised cattle and sheep on the property, but he hired others to do this work while he concentrated on the early development of the Caterpillar tractor. His father-in-law,

Abraham Holt, began experimenting with track-laying tractors around 1904. After World War I, Holt, Starr, and Bess (formerly of Bess Tractor in San Leandro) merged and formed the Caterpillar Tractor Company. Starr, "a natural inventor," built the machine shed at the ranch and experimented with the Caterpillar. Starr and his men test drove tractors on the ranch (Ladd pers. comm.). Starr's ranch was held up as model of efficiency (Purcell 1950):

Starr's cattle ranch on the Vasco is a model institution, equipped with caterpillar tractors and other modern farm machinery. Home buildings of Spanish architecture and landscaped grounds, spacious fireproof storage sheds with concrete floors, generating power plant and water system are but a few of the features of the 8,000 acre establishment that is conducted on an efficient business basis.

Edith Ordway bought this portion of the Starr Ranch in 1948 (Official Records 1168:195). Ordway tore down Starr's residence and built a new residence on its foundation.

Charles and Sue Nissen also purchased Los Vaqueros acreage from Crocker's heirs as an investment in the 1930s. The Nissens resided in Livermore where they had a hay and grain business and leased to Crocker's tenants, making improvements to the properties, including at least one residence (Nissen pers. comm.). The Nissen tenants moved their dwellings out of Los Vaqueros when the property was sold following the Nissens' deaths.

SITE TAXONOMY

While development of a site taxonomy would appear to be a seemingly simple task, it is replete with pitfalls, as demonstrated by Thomas (1983) and discussed below. The issues are not easily resolved; however, prior investigations in the Los Vaqueros area have produced sufficient information to generate an initial site taxonomy which can provide a starting point for organizing the archeological record.

Prehistoric and Ethnohistoric Site Types

Since a generally accepted classification system for prehistoric or ethnohistoric archeological sites does not exist, sites are most frequently referred to from two different perspectives, one emphasizing visible elements (e.g., rock shelter, midden, lithic scatter), the other focusing upon inferred function (e.g., hunting camp, base camp, village). Neither is satisfactory. In the first case, visible elements are often combined in various ways that make internally consistent or systematic classification difficult or unwieldy. In addition, subsurface materials may require revision of site type; for example an apparent lithic scatter may contain subsurface materials indicative of substantial residential use.

In the second case, subsurface materials may also require revision of site type for much the same reason (e.g., what appears on the surface does not necessarily reflect what

is in the ground). Because both kinds of classification depend largely on observable attributes (in more sophisticated attempts, including the environmental context), assigning a site to a particular type can be considered an initial hypothesis subject to revision after subsurface investigations provide more information.

In the present case, property types are classified in functional terms, depending on identifiable site attributes, but subject to verification through subsurface sampling. The approach emphasizes what appear to be major attributes rather than exclusivity of attributes.

Milling Stations

Milling stations are marked predominantly by bedrock mortars. Such sites may or may not contain associated subsurface deposits; when such are apparent they are localized and small in area.

Open Sites

Open sites are marked by the presence of what appears to be midden, often located so as to command an overview of valley lands. These sites, which may be special-purpose stations or base camps, may have associated bedrock mortar features.

Large Occupation Sites or Small Villages

These sites are marked by a relatively large size and a higher degree of diversity of materials than base camps. The only site of this class is in Round Valley, just north of the project area (i.e., CA-CCo-320, shown on Map 1).

Rock Shelters

Rock shelters contain archeological deposits adjacent to or within often shallow concavities in the horizontal face of large rock outcrops; they sometimes occur with associated bedrock mortars.

Rock Art Sites

These sites have drawing on the face of large rock outcrops; such sites may be associated with rock shelters, bedrock mortars, and open subsurface deposits, but because of their rarity in central California are given status as a separate site type.

Ranch Sites

These sites presumably date to the Post-Mission Period, have Native American materials, and are located near early historic ranch structures, but do not contain evidence of significant soil modification.

Historic Site Types

In accordance with National Park Service draft policy (1989), historic archeological property types for the Los Vaqueros Project area are organized as "feature systems", sets of functionally associated phenomena that may cross the traditional distinctions between domestic and economic activities. This approach emphasizes the related processes engaged in at a site rather than the individual objects or structures located there.

Isolated Domestic Features

These include:

- structural remains, extant and archeological: footings, cellar holes, chimney bases, dugouts, rock shelters, collapsed and standing residences, temporary or permanent;
- refuse concentrations and caches; primary and secondary deposits; and
- exotic vegetation.

Ranching and Water Management Features and Complexes

These include:

- reservoirs, corrals, windpumps and troughs, dams, spring improvements, ditches, collapsed and standing ranch buildings and
- exotic vegetation.

Integrated Domestic/Ranching Complexes

These include:

- elements of the preceding two feature systems at the same location, temporary or permanent.

Infrastructure Features and Institutions

These include:

- roads, trails, fences, creek improvements, schools.

In accordance with federal guidelines, deflated or collapsed buildings were treated as archeological phenomena, while standing structures are considered architectural properties.

RESEARCH ORIENTATION

Theoretical Basis for Prehistoric Archeology

The research design for the evaluative phase of the Los Vaqueros Project is based on the upper Kellogg Creek watershed viewed as a research universe. In this case, the research universe is isomorphic with the APE. The APE for water conveyance facilities extends into the Delta; however, the majority of resources to be evaluated for their NRHP eligibility are located within the watershed. The convergence of management requirements (the APE) and the research universe provides an appropriate and opportune framework for addressing basic archeological issues related to chronology, subsistence settlement, and exchange and interaction.

Americanist archeology is in the throes of a debate that pits two competing strategies for research against each other. One camp, the post-processualists, have attempted to move away from strictly materialist explanations of human behavior and "focus on ideas, symbols and mental structures as driving forces in shaping human behavior" (Thomas 1991). The other camp, the processualists, view culture as an adaptive strategy in an evolutionary sense. The processualist studies the on-the-ground results of human behavior in an attempt to generalize underlying processes that guide human behavior. Regardless of orientation, archeologists recognize that all things must be ordered in time and space before undertaking the more sophisticated and abstract questions that address general anthropological theory. In some instances, the post-processualist paradigm can be more logically employed when ethnographic or historic data are available by incorporating the emic perspective not normally available to the prehistoric archeologist who is frequently left only with the etic, the material outcome of behavior.

The processualist/post-processualist debate is reconciled when archeological inquiry is geared to addressing archeological questions focused on chronology and lifeways. This is not meant to imply that inquiry must stop at a more basic level; rather, the sequence of research is necessarily based on theoretical building blocks that have been recognized either explicitly or implicitly by archeologists for the last half-century. Viewed as a cultural continuum, the Los Vaqueros research universe is amenable to research guided by both paradigms, depending on the kinds of issues being addressed and the period being studied.

As described above, the Los Vaqueros Project can be viewed as a research universe that conforms with a watershed. By delineating the environmental setting in this way, it is appropriate to assess the extant cultural resources as a "district". This approach requires evaluating each cultural locus within the district in terms of its ability to address research questions considered germane to identified research issues for the area. The outcome of such an approach can result in individual sites that on their own might not be significant, but are judged significant in the context of a district. For the prehistoric period at Los Vaqueros, three research issues exist from which a site's significance can be appropriately investigated within the context of a district. These broad issues are chronology, subsistence-settlement, and exchange and interaction.

Research Domains for Prehistoric Archeology

Chronology

Ordering things in time is archeology's basic charge. However, building chronological sequences is not an end in itself, it is a beginning. Archeology is the one wing of anthropology that can provide the long-term perspective that is essential to undertake the studies that can provide information on cultural evolution, human ecology and the myriad other topics that unify the discipline with anthropology. First, however, data must be ordered in time so that we can conduct synchronic and diachronic investigations of human behavior that make archeology the powerful arm of anthropology it can be.

Fredrickson has developed a hypothetical reconstruction of Los Vaqueros prehistory that can be used as a basis from which to pose research questions regarding chronology.

Hypothetical Reconstruction

Paleo-Indian Period, 10,000-8,000 B.P. It would not be unreasonable to imagine the present Los Vaqueros study area, including the northern flatlands, to have looked quite different 8,000-10,000 years ago under Anathermal climatic conditions during the Paleo-Indian Period. Sea level had only recently reached the Golden Gate, and San Francisco Bay had not yet attained its historic size. It is likely that the present-day tidal marshland of the Delta system was not yet established and that the elevation of the Central Valley was lower relative to the elevation of today. Alluvial deposits laid down during the Post-Glacial Pluvial Period were beginning to raise the Delta level.

The hills above Kellogg Creek may have been somewhat higher in relative elevation than today, and the valley itself was deeper and less broad. The peat lands of the Delta had not formed, and the flatter, sandy lands north of the upper Kellogg Creek valley was also lower in elevation and probably more rugged than today as it dropped down to the much lower elevations of the large river created at the confluence of the Sacramento and San Joaquin Rivers.

Vegetation was radically different than that found today. Because of the much damper climate, it is possible that the redwood forest may have extended eastward much further than it did at the time of initial European entry into the California coastal lands, although the rainshadow of Mt. Diablo may have restricted the amount of moisture required by this forest. The presence today of relict plant communities supports the belief that mixed evergreen forests and live oak woodlands existed in the area. The area may have been similar to today's forested Santa Cruz Mountains. It is likely that human use of the region, if any, was likely focused on the resources of the lowlands to the east.

It is likely that the human population statewide was quite small, organized into small family bands that ranged over a wide territory in their quest for subsistence. Findings from this period elsewhere in the state do not support (but do not rule out) the idea that these bands were big game hunters. Most evidence of human use comes from the shores of ancient lakes, such as Tulare in the central San Joaquin Valley and Buena Vista in the southern San Joaquin. Tracy Lake, located east of the project area in the San Joaquin Valley, may have shared in this pattern. If the study area had been used at this time, it would have been for short forays by hunters or gatherers of spring greens and other plants. Because the human population was small and there was little pressure on the food supply, the lowland valleys, lakes and other resources in their vicinity would have provided sufficient sustenance without recourse to less productive forested area that the project area once may have been.

Lower Archaic Period, 8,000-6,000 B.P. Between 6,000 and 8,000 years ago, the climate was probably still relatively cool and moist, although it was probably becoming warm and dry in southern California. Sea level continued to rise relatively rapidly until about 7,000 B.P. when the rate of rise slowed (Bickel 1978) as San Francisco Bay approached its present form. At about this same time, the initial stages of marshland formation in the Delta began. The Central Valley was still at an elevation lower than today, and any archeological site located in what is now the Delta is either buried beneath layers of sediment or destroyed through hydrological processes. The topography of the Kellogg Creek watershed was probably still more pronounced than today, and the peat soils of the Delta had yet to form. The lands north of the upper Kellogg Creek watershed may have been flooded to some extent as the sea level rose. Vegetation remained much the same as during the preceding period.

It is reasonable to assume that the widespread Milling Stone Horizon, identified in the north Coast Ranges for this period (e.g., Damon 1979 [Mendocino County], Bramlette and Fredrickson 1987 [Lake County], White 1984 [Lake County], and Wickstrom 1986 [Sonoma County]) with some indications of its occurrence in portions of the south Coast Ranges, was the basic culture for central California. It is likely that the economic unit remained the small family band that ranged over a relatively wide territory, following the forager routine of seeking out resources as they became seasonally available. Although it is likely that technological and economic modes were different from those of the preceding period, the use of the study area probably did not change. As before, because there was little pressure on the food supply, there was little need to make use of the less productive resources of the project area.

Middle Archaic Period, 6,000-2,500 B.P. During the early part of this period, San Francisco Bay reached more or less its current level, although subsidence has since lowered the bases of many Bay shell mounds below sea level. The estuarine system of both the Bay and Delta were fast maturing as the marshes became well developed and shellfish populations and marshland productivity became established. These environmental events were accompanied by the onset of a climate that was markedly different from earlier periods, becoming warmer and less moist. Plants adapted to more arid, less temperate environments extended their ranges at the expense of those adapted to more mesic environments. In addition, extensive soil deposition on the floor of the Central Valley occurred, with up to 10 meters of sediments deposited over the past 5,000-6,000 years (Moratto 1984).

Heizer (1949) has suggested that Windmillers, the earliest documented culture of the Delta region, was oriented more toward hunting than seed gathering; while Delta resources were likely to have been used, the orientation of the culture may have been at least equally oriented to the Sierra Nevada foothills (Moratto 1984). Archeological evidence for the Windmiller subsistence base is sparse, however, and more information is required before more certain statements can be made (cf. Schulz 1981). Although Windmiller sites have been found almost directly east of the present project area north of Stockton, none are known in the vicinity of the project area. Evidence for occupation beginning about midway through the Middle Archaic has been found along the shores of San Francisco Bay, with evidence of an earlier terrestrial-oriented culture found at the south end of the San Francisco Peninsula. Whether the ethnographically known acorn complex was present or widespread at this time depth is questionable. Although it is possible that semisedentism (i.e., the presence of seasonally abandoned villages) was developing during this period, it is unlikely that population pressures encouraged use of the project area, with the possible exception of portions fronting the Delta waterways.

Upper Archaic Period, 2,500-1,000 B.P. Although at the beginning of this cultural period a significant climatic change occurred in northern California, from relatively warm and dry to a cooler and moister climate, little evidence of it has been identified in central California. As suggested by Banks et al. (1984), heavy rains following an extended dry spell accelerates erosion. The intensive soil deposition noted in archeological sites in the Pleasanton-Walnut Creek-Concord strip provides evidence for this. Not all sites from this period have been buried, however, because many have been found throughout central California.

At the beginning of this period, the lifeways of the San Francisco Bay region (the Berkeley Pattern), which included a focus on marshland and other bayshore resources, matured during the prior period with the development of a collector adaptation. Beginning about 2,500 B.P., Bay culture radiated out into the north Coast Ranges as far north as Clear Lake, and east toward the Sierra Nevada Mountains, replacing or radically transforming the Windmiller culture. In the northern San Joaquin Valley, however, there was a coalescence of the indigenous culture with that emerging from the Bay region. The culture represented by the sand mound burial sites in the Delta at the northern end of the project area is believed to derive from the beginning of this cultural period (Cook and Elsasser 1956).

Although the expansion of the Berkeley Pattern hypothesized for the early portion of this cultural period was probably a function of population growth, the newly inhabited environments were sufficiently productive so that population pressure did not prompt the use of the less productive areas, such as the project area. It is possible, however, that brief forays were made into the project area for hunting or gathering purposes. It is likely that group size of those who participated in the Berkeley Pattern adaptation was greater than that of contemporaneous groups in less productive environments who were likely to have retained the forager lifeway with collector influences. The success of the Berkeley Pattern was marked by appearance of sociopolitical complexity and the development of status differences based on wealth. These developments were not uniform, with most occurring within localities with the most productive resource base.

Lower Emergent Period, 1,000-500 B.P. The Lower Emergent Period (Fredrickson 1973) marks a radical change in central California culture that has been hypothesized to have been at least partially related to a new population entering the region with a new technology that included the bow and arrow (rather than the atlatl and dart). As sedentism became more entrenched, social change was now a major factor in central California. Mortuary evidence suggests the spread of a group-oriented religious movement throughout the Bay and Delta regions (Fredrickson 1974a) extending north to southern Shasta County and south to Merced County. As the collector adaptation became widespread, exchange systems became more regularized and extensive, initially linked with religious obligations; evidence for distinctions in social status linked to wealth became more common.

As part of the shift from the wide-ranging forager adaptation to that of the more sedentary collector, and in part a function of population growth, territorial boundaries probably became more clearly defined and the ethnographic tribelet emerged as the basic sociopolitical and economic unit (cf. Bennyhoff 1977). As the importance of collector communities increased and intergroup relations in central California became more important with respect to religious, kinship, and exchange systems, contemporaneous forager communities must be studied with reference to collectors, following the original French use of the term "protohistoric", used in relation to the study of peoples without writing who must be studied with reference to the history of literate society (Hole and Heizer 1969). The initial sustained use of the project area occurred during this period on a seasonal basis with no year-round residency.

Upper Emergent Period, 500-200 B.P. Social change accelerated during this period in central California with increasing evidence for wealth distinctions; the appearance of the clam disk bead monetary system; and the development of local specializations related to craft, ritual, and exchange. Considerable environmental-based cultural diversity existed, however, with groups in productive habitats pursuing a fully developed collector lifeway, while others in less productive habitats pursuing a mixed lifeway of collector and forager; collector during periods of abundance where group-organized resource procurement was effective and forager during periods when the family band was a more productive economic unit. The project area is believed to have served as a seasonally used resource procurement area for a collector group whose major village was located within adjoining Round Valley or the John Marsh ranch area. It is possible that families established year-round residency

within the project area with firm social, economic, and political ties to the major village. Inter-marriage between neighbors speaking mutually unintelligible languages (Bay Miwok, Ohlone, Yokuts) was common, creating reciprocal kinship, political, and economic relationships.

Ethnohistoric Period, 200-130 B.P. Early during this period, the peoples who used the project area were systematically removed to the Spanish missions. Between 1812 and 1836, eastern Contra Costa County may have been virtually uninhabited, except for small family groups that may have used the project area as a refugium. The rock art of the project area may have been produced during the refugium period or during the Post-Mission Period by Native Americans familiar with rock art from other regions. By the late 1830s, land in the region had been taken over by those of European descent, including Marsh and Alviso. Marsh's labor force consisted of Julpun and Volvon Native Americans recently returned from Mission San Jose. As described above, Alviso employed Native American vaqueros who lived on the land and herded the cattle. Marsh and Sutter exchanged Native American laborers at certain times of the year to plant and harvest crops, which may have influenced the movement of Native Americans from the Livermore-Pleasanton area to Ione and other Sierran foothill communities.

Regional Chronology. Archeological excavations in the region have yielded key artifacts and traits that are temporally sensitive. Time markers that have been observed near the Los Vaqueros Project area are correlated by site and period in Figure 11. Correlation with these regional chronological signatures with the Los Vaqueros area awaits further research.

Chronological Indicators for the Project Area. Two forms of chronological data were gathered for the project area during the inventory phase, including the observation of rare time-sensitive artifacts and the analysis of obsidian hydration rims. Time-sensitive artifacts are restricted to small serrated and corner-notched projectile points, both of which mark Late or Emergent Period components at sites in the region.

Hydration analysis was conducted on obsidian samples identified (by visual and x-ray fluorescence techniques) as from a Napa Valley source. Rim readings clustered between 1.0 to 3.0 microns. Based on the hydration analysis of time-sensitive artifacts made from Napa Valley obsidian artifacts at other locations, it has been suggested that these readings represent Emergent Period activities in the project area (Bramlette 1989). Figure 11 illustrates the suggested correlation between Napa obsidian hydration rim measurements and chronological sequences for the Los Vaqueros Reservoir vicinity. Bramlette's table reflects Fredrickson's use of periods as separate from cultural patterns.

Although Bramlette noted the possibility of finding buried sites and older components of known sites within the project area, he argued that the absence of older rim measurements indicated that the project area experienced only sporadic use before the Emergent Period. He reasoned that the cluster of rim readings indicated that use of the project area intensified during the Emergent Period. Bramlette also noticed that many of the specimens dated to the Upper Emergent Period retained cortex, while many of the specimens from

**Figure 11. Postulated Correlation between
Napa Obsidian Hydration Rim Measurements and
Chronological Sequences for the Los Vaqueros Project Area**

Years Before Present	Period	Cultural Pattern	Napa Obsidian Hydration
	Historic	Historic	
200			0.9 microns
	Upper Emergent	Augustine Phase 2	
500			2.0 microns
	Lower Emergent	Augustine Phase 1	
1000			3.0 microns
	Upper Archaic	Berkeley, Var: Morse, Meganos	
2500			5.0 microns
	Middle Archaic	Berkeley and Windmiller co-exist	
6000			6.5 microns
	Lower Archaic	?	
8000			7.0 microns
	Palaeo Indian	?	

Sources: Bramlette 1989, Banks et al. 1984

Lower Emergent Period did not. He suggested that this probably reflected a shift in obsidian procurement strategies occurring between the Upper and Lower Emergent Periods.

Research Questions

- Does the project area conform to Fredrickson's chronology? sites in
- Do sites in the project area date to before 1,500 B.P.?
- Are older sites present in the project area that have been buried by alluvial deposits?
- If multi-component sites are present in the project area, do settlement patterns change over time?

Potentially Contributing Data Sets

- Chronological indicators, such as radiocarbon dating, obsidian hydration analysis, temporally diagnostic artifacts and traits and
- Site type and location information.

Subsistence-Settlement

The Los Vaqueros research universe provides a unique opportunity to examine subsistence and settlement issues within an environmentally circumscribed area in this region of California. This approach provides the necessary controls to examine site interrelationships, adaptive strategies, seasonality, and intergroup relations. Previous research, constrained by funding and project requirements, focused on individual or small clusters of sites. Although certain issues regarding chronology and site-specific adaptation could be addressed with such a database, broader questions regarding hunter-gatherer adaptation from an ecological perspective remain largely unanswered because interpretations of the data are skewed by single site perspectives.

The weakness of attempting to generalize prehistoric hunter-gatherer behavior from a single site is classically illustrated in the Great Basin where Jennings (1957) attempted to generalize a cultural adaptation, the Desert Culture, from a single site, Danger Cave. When regional studies began to support alternative interpretations, Jennings (1973) recanted his earlier position.

In an attempt to cast hunter-gatherer adaptation into an evolutionary perspective, Binford (1980) introduced a typological scheme based on a *continuum* from foragers to collectors. A major assumption underlying the Los Vaqueros research plan is that a necessary relationship exists between cultural behavior and the natural environment among hunter and gatherer populations. At less complex levels of sociocultural integration (e.g., the family band, extended family organization) the relationship is close and characterized

by the movement of the effective economic unit to the resource as it becomes available. Binford has termed groups organized in this manner as "foragers". A forager strategy is characterized by high residential mobility.

At the other end of the continuum are collectors who often break into specific task groups to procure particular resources, which are then returned to a major village (base camp). At the extreme end of the spectrum of the collectors are those with firm territorial boundaries who are dependent not only on well-developed food storage capabilities but on the exchange of goods with neighbors assuming needed resources are not equitably distributed in nature. At this extreme, because of the development of more complex exchange relationships, the heavy dependence on and necessary response to environmental forces is transcended to some extent to be replaced by a need to develop and be dependent on complex social relationships.

In both cases, forager and collector, the principle of optimization is heuristically assumed. Optimization here is meant as the long-term tendency for a group to find solutions to the problem of attaining an energy input/output balance that will allow for reproductive success. Processes of optimization for foragers include responses to the seasonal availability of resources and resolution of scheduling problems when key resources become available at the same time but at different places, and even a randomness (or flexibility) of behavior in environments that tend to be unpredictable with respect to occurrence of resources. For collectors, an additional problem must be solved because relationships with people tend to become more important because of their differing roles in allowing or denying access to key resources not otherwise available.

Thomas (1983) has identified certain potentially observable archeological implications of viewing the forager-collector continuum as a set of adaptive strategies, including:

- specific site patterning in time and space;
- degree of microstratigraphic integrity of specific site types;
- long-term positioning and land use strategies;
- approaches to economic zonation;
- patterns of faunal transport and discard;
- staging, damage, and discard of lithics;
- long-term implications for sedentism;
- implications for population growth and increase of resource exploitation; and
- long-term potential of given strategies across varying landscapes.

These implications can be viewed as subsistence-settlement research issues that the Los Vaqueros Project may have the potential to address to some degree. The key here is what the material outcomes (the archeological signatures) will be in the archeological record.

To conduct research in this arena, certain prerequisites exist, including:

- sites and components must be controlled chronologically to evaluate change in subsistence and settlement through time;

- the hypothetical characteristics of the Los Vaqueros environment must be structured for a given period in terms of spatial and temporal availability and relative costs for procurement, transport and storage; and
- operational definitions of specific site types in terms of their in-the-ground archeological consequences must be clearly articulated.

The foregoing discussion establishes a theoretical framework in which to examine basic subsistence-settlement issues for the Los Vaqueros Project area. It must be emphasized that there is no published model for subsistence-settlement use in the area. An essential component to subsistence and settlement studies is the generation of paleoenvironmental data from archeological and nonarcheological contexts. The articulation between environmental setting (what resources were available?) and resource procurement (what were people eating?) is brought into focus when both sets of data are examined. The interplay of these data sets contributes both to reconstruction of past environment and human interaction in it. The approach presented above can yield basic synchronic and diachronic information about topics, such as:

- resource procurement (including seasonality and relative importance);
- changes in settlement patterning that may relate to shifting adaptive strategies; and
- understanding the similarities and differences between the Los Vaqueros Project area with reference to regional patterns of the San Francisco Bay, San Joaquin/Sacramento Delta, and Central Valley.

Based on Simons' hypothetical reconstruction of resource availability, limited chronological information for the project area, and survey data, Fredrickson postulated that following maturity of the Delta system, plant resources within the project region reached their greatest abundance and diversity during summer and fall, while animal resources reached their greatest diversity and productivity during fall and winter; more limited resources were available during the spring. In addition, grasslands possessed the greatest diversity and abundance of animal resources (cf. Simons 1982 and Eidsness 1986). From this, Fredrickson has postulated that the reservoir portion of the project area is within the catchment of a major tribelet village, possibly located to the northwest. Buried sites or older components of known sites representing different adaptive strategies or focus may be present in the project area.

Research Questions

- Was the project area occupied seasonally, year round, or only for short-term, resource-specific procurement?
- Is there variability in site types within the project area over time that would indicate shifting adaptive strategies? Subsets of this question include the following:

- Will archeological sites contain low diversity of materials and tool types reflective primarily of the procurement and processing of plant materials and secondarily of activities, such as tool maintenance, related to hunting?
- Will Archaic Period sites (if found) be task specific with low constituent diversity?
- Will upland Archaic Period sites occur less frequently than Emergent Period sites (lowland areas are excluded from the test because it is believed that lowland Archaic Period sites will be underrepresented because of soil deposition processes)?
- Will Lower Emergent Period sites be predominantly task specific with low artifact diversity and fewer small, possibly seasonal campsites?
- Is there more intensive use of the Los Vaqueros area during the Upper Emergent Period?
- For any given period, how does subsistence and settlement in the project area compare with the San Ramon Creek and Alamo Creek watersheds?

Potentially Contributing Data Sets

- Temporally sensitive artifacts or traits,
- Assemblage diversity,
- Technological analyses of artifacts (e.g., lithic reduction, breakage and use-wear studies),
- Site type (functional typology),
- Geographical distribution of sites,
- Site structure (single component or multi-component, palimpsest, surface, buried),
- Site features (e.g., dimensions and numbers of mortar depressions on outcrops),
- Faunal remains (cultural and noncultural),
- Plant macrofossils, and
- Palynological data (from cultural and noncultural contexts).

Interaction and Exchange

The perspective adopted here is derived and adapted to a large extent from theoretical perspectives developed by Cohen (1970, 1975) who postulated that every society, by virtue of living in contact with other societies, is characterized by two sets of processes. One set Cohen referred to as "inside culture", the other he called "boundary culture". Inside culture corresponds to the traditional concept of culture and in the present context would be covered under the rubric of "lifeways". Boundary culture, on the other hand, represents the processes involved in the interactions between interdependent societies, and is conceived as being organized to regulate, control, or administer the movement of goods and ideas between societies.

The model continues in that relations between societies are mediated by designated individuals and, to the degree that resources outside the group territory are important to a society, these individuals carry out roles that tend to become specialized and differentiated from the roles of inside culture. A postulate of the model is that centrally administered exchange is more effective in maintaining and regulating an orderly flow of ideas and materials than exchange that is carried out on an *ad hoc* basic. Thus, once centrally administered exchange systems emerge, positive feedback will tend to emphasize its importance over time, as well as the importance of the administrative roles. To the extent that boundary culture is important to the successful adaptation of a society, then boundary personnel, through their administrative function, will tend to gain social influence and political power. Because roles of social influence and political power frequently carry with them material representations such as wealth and status objects, it is possible archeologically to observe the parallel development of exchange systems and social differentiation based on wealth.

From this perspective, the change from a forager adaptation to a collector adaptation is not only a function of adequate resource availability and an appropriate extractive and procurement technology, but also a function of the relationships with neighboring groups who control resources not available in the home territory because of its natural absence or exigencies such as locality-specific crop failure. See Fredrickson (1977, 1980) for an application of this perspective, in which data from the Walnut Creek/Danville vicinity of Contra Costa County suggest a shift from forager to collector adaptations with corresponding changes in exchange systems and inferred sociopolitical complexity.

Specifically, Fredrickson (1969) reported that the use of obsidian in the Walnut Creek/Danville area showed a significant increase during the Lower Emergent Period as compared with the earlier Upper Archaic Period. The shift in obsidian use has been hypothesized to mark the development of a regularized exchange system, indicating a change from an Archaic foraging strategy to a collector strategy (see also Bramlette 1989).

Research Questions

- What is the temporal, geographic, and source variability of obsidian in the Los Vaqueros area? Subsets of this question include the following:

- Is obsidian rare to absent in Archaic Period sites?
- If obsidian occurs in the Archaic Period, will it be limited to formal artifacts, broken artifacts, and flakes indicative of maintenance and repair?
- Given sufficient sample size, will the obsidian in Archaic Period sites have relatively high source variability?
- Will obsidian debitage found at surface sites within the study area date to the Emergent Period and exhibit low source variability?
- How does obsidian use in the project area compare with obsidian use in the San Ramon Creek and Alamo Creek watersheds?
- Is obsidian use in the Los Vaqueros Project area indicative of regularized exchange during the Emergent Period and *ad hoc* exchange during the Archaic Period, as observed elsewhere in Contra Costa County.
- What is the temporal, geographic, and source variability of other exotic materials in the Los Vaqueros area?

Potentially Contributing Data Sets

- Obsidian (x-ray fluorescence) and
- Presence and amount of exotic materials (shell beads, nonlocal lithic materials).

Theoretical Basis for Ethnohistory

The primary goal of ethnohistoric research is to explicate cultural change. According to Dobyns, ethnohistory should add to the

advancement of our understanding of culture or cultural process by analysis of human group behavior through time . . . using protocols of an historic nature, preferably analyzed for purposes other than those originally intended by the author, and in categories based upon modern field investigations [as cited in Euler 1972].

In many ways, ethnohistoric research bridges the gap between the hypothetico-deductive and contextual approaches guiding the prehistoric and historical archeological research being conducted at Los Vaqueros. This bridge is built largely on the premise that ethnohistoric research can draw data generated from both approaches. Drawing on multiple sets of data, including written records, ethnographic information, and archeological data, allows ethnohistoric period research to be conducted within a chronological framework, and acculturative factors or trends be addressed.

Ethnohistoric research for this project has been directed by information obtained while conducting historic research that indicated that during the rancho period, landowners in the project area employed Native Americans as vaqueros. Information was also obtained suggesting that the project area was used as a refugium during the Mission Period or Early Post-Mission Period and that some descendants of those who inhabited the area during this period reside today in the Sierra Nevada. Research issues that can be developed from these hypotheses are outlined below.

Research Issues and Questions for Ethnohistoric Archeology

Settlement and Subsistence in the Mission and Post-Mission Periods

- Did Native Americans use the mountainous portion of the project area as a refugium during the Mission Period?
- Did Native Americans work on ranchos during the Mexican and early American periods?
- Did Native Americans use traditional resources while working on the ranchos?

Tribelet Group Boundaries and Relations

- Were the boundaries between the Julpun to the north, the Volvon to the west, and the Saoam to the south fluid? Did tribelet boundaries change during the ethnohistoric period?
- Can individuals who belonged to specific tribelets be identified as workers on ranchos in the project area?
- Where did Native Americans go when they ceased working on the ranchos in the project area?

Acculturation

- How did subsistence and settlement practices change during the ethnohistoric period?
- To what extent were traditional lifeways and cultural practices retained (or abandoned) during the ethnohistoric period?

Potentially Contributing Data

- Artifact assemblages (e.g., Mission Period sites studied elsewhere have contained small numbers of historic materials, such as glass beads, dating no later than the Mission Period, while post-Mission sites have yielded a broader array of historic

materials, such as glass beads and bottle glass dated from the post-Mission Period and Late Mission Period traditional artifacts);

- Site locations (e.g., refugium sites have been found elsewhere in locations that provide both visibility over a broad area and retreat routes, while post-Mission sites have been found near historic rancho structures);
- Faunal and floral analyses (e.g., conducted elsewhere to determine whether Native Americans living in the project area during the post-Mission Period employed a combination of traditional and newly learned subsistence practices as indicated by dietary debris of both native and domesticated animals);
- Mission records (e.g., analysis of personal names contained in baptism, marriage, and death records [combined with examination of other primary data] may clarify the geographic locations of group boundaries and the degree to which they were well or poorly defined [cf. Callaghan 1982, Milliken pers. comm.]. Mission record data relating to family history may show at least two generations of marriages that will provide a track toward identifying possible descendants and the ethnohistory of those descendants during the Mexican and American periods [Milliken pers. comm.]);
- ethnographic research (includes oral interviews with descendants of eastern Contra Costa County Native Americans and interview data from elderly residents of eastern Contra Costa County); and
- archival data (includes unpublished data for Native Americans observed near the project area).

THEORETICAL BASIS FOR HISTORICAL ARCHEOLOGY

Because one of the goals of this study is to evaluate the significance of archeological properties, it is appropriate to examine two models of understanding and investigating the past that have come to predominate among theorists. This is intended not as a critique of the goals of processual archeology, rather as a critique of the strict application of the hypothetico-deductive model, which has been historically associated with this approach.

The hypothetico-deductive approach typifies the "new archeology" popularized by Binford and his followers. In historical archeology the most extreme form of this movement is exemplified by the often ahistorical work of South. As the paradigm is, at base, positivistic, research focuses on issues that can be resolved by the methods of normal science and phenomena for which relatively unequivocal material correlates or indicators exists. Although the search for general laws of behavior and cultural process has been given less emphasis of late (Malina and Vasicek 1990), new archeology practitioners tend to seek causality in statistical regularities.

Since the early 1970s, parallel, competing approaches have developed from a new paradigm to challenge what had become the new orthodoxy. Post-processualism (cf. Leone 1986) eschews the search for statistical regularities and much of the empiricism of the new archeology, focusing on issues of symbolism, ideology, and power. Contextual archeology (Hodder 1986, 1989) has emerged as a particularly powerful approach. Significantly, the approach parallels the trend in the social sciences in general toward problems of "contextuality, the meaning of social life to those who enact it, and the explanation of exception and indeterminants rather than the regularities in phenomena observed" (Marcus and Fischer 1986).

Specifically, contextual archeology emphasizes the specific historical, social, and cultural context of behavior rather than cultural process. Structuralism, symbolism, critical theory, and "meaning" (Leone 1986) are stressed in interpretation. Because prehistorians are limited to examining the etic, it is the historical archeologist who can most readily adopt a post-processualist perspective that can draw from both emic and etic behavioral data. The contextualists also recognize the active role of both material culture and the archeologist in the creation of the past.

For the present argument, the most significant element of the post-processual approach is that the research issues are not as amenable to hypotheses testing as those of the new archeologists. The former claim that the latter trivialize and dehumanize the archeological record by their approach, so this characteristic is not seen as a drawback, but rather as a "reality check." The difference in method reflects a different approach to the meaning of artifacts. While the new archeologists strive for predictability, post-processualists insist that this is a vain search (i.e., that the meaning of artifacts is dependent on the context of their use) (Hodder 1986, Praetzelis et al. 1987). It is this dependency, however, that makes historical archeological inquiry more amenable to a post-processualist approach. The historical archeologist has multiple sets of data from which to draw, including the written record, unavailable to the prehistorian.

James Deetz (1988) characterizes the nature of research in archeology as follows:

In the nonexperimental sciences (if archeology is indeed a science), precise certainty is rarely achieved. Rather, research takes the form of a gradual refinement of explanation, as more and more factors are incorporated into the construction of the past that one is attempting to create. In historical archeology, this refinement is best accomplished by maintaining a balance between the documentary and the material evidence, being always mindful that, to be a productive exercise, the results should provide a more satisfactory explanation than would be forthcoming from either set of data alone.

In this view, archeological analysis is complex and explanations are "constructed" through both deduction and induction. The object is not to make exclusively archeological discoveries, but rather to weave data from a variety of sources into a multifaceted explanation.

Archeological sites can be evaluated under the existing federal guidelines without relying exclusively on the hypothetico-deductive method. By using the "contextual" model, evaluations will be grounded more in historical and social reality, and are less likely to be based on statistics supported by limited data. We can still ask: "Can this site make a real contribution to some important research issue?" but the method by which we find the answer is different, stressing instead examination of sites as expressions of well-defined contexts and the ability of sites to exemplify well-defined contexts in addition to the types and character of the archeological data that they contain.

Research Domains for Historic Archeology

Several issues emerge from the overview/context statement that suggest realms of inquiry to which the sites may contribute. The strongest theme is effect of the physical environment on local adaptations. It is not surprising that this theme passes through or links other issues, for the land was seen as a natural resource to be used in relation to the commercial economics of the era.

From the Mexican era onward, local ranchers were engaged in market production; subsistence agriculture seems to have been little practiced. Although there has been a remarkable continuity in the dominant economic practice of the area and mode of production, cattle raising for market sale, the nature of the productive unit and relations of production have changed. The rancho era was marked by the presence of Mexican owner-occupiers who used the land extensively and whose Native American workers lived, in many cases, as serfs on their traditional lands. The early American period saw a reorientation from the production of cattle for the hide-and-tallow trade to beef raising. The same Californio families continued to raise cattle here through the 1860s or 1870s. Following the settlement of the land claim case and the awarding of much property to the Western Pacific Railroad's agent, Charles McLaughlin, the land was leased to families who raised cattle. Mary Crocker, a McLaughlin heir, further divided her property and leased portions to a larger number of tenants and sharecroppers. The Los Vaqueros uplands was probably most densely populated, by both owners and renters, during the late 19th and early 20th centuries.

The research issues and archeological data requirements that follow have been devised to reflect the range of properties identified during field inventory and types of features that previous experience has shown tend to be present on rural sites. The Mexican and early American eras are represented in the remains of rancho headquarters with associated adobe buildings. The later American era ranching left remains of property boundaries, animal management devices, and temporary worker camps and permanent family homes.

For the sake of clarity, the following discussion is divided into themes and sub-questions. The research issues are not discrete, however, and impinge on each other in both data requirements and interpretation (e.g., the construction of fences may have had both utilitarian and symbolic significance). In accordance with the contextual model of archeological interpretation presented above, the issues and specific research questions

generally require data from both archeological and documentary or oral sources. All require developing more focused contextual frameworks from nonarcheological sources that are essential for the interpretation of the material remains. The "Contextual Requirements" and "Archeological Data Requirements" sections that follow each specific research issue are equivalent to registration requirements mandated under 1983 National Park Service guidelines (48 CFR 44726-44727); a property that appears to contain these data may be eligible to NRHP under criterion d.

Steven Wee has written that "there is virtually nothing written in the historical literature on [the] heretofore 'invisible' Mexican-Californio small ranchers and farm laborers of the west side of the San Joaquin Valley" (Wee 1990). The same could be said of the southern European immigrants who replaced them in the Los Vaqueros uplands. Although the reconstruction of these lost ways of life is not among the research issues enumerated below, this goal is implicit in all of them.

Research Issues and Questions for Historical Archeology

Ranching Adaptations Relative to Environmental Conditions. The Los Vaqueros uplands is an area of Mediterranean climate. In the summer and fall forage is sparse and pasture nearly unknown. In the historic period, range cattle raising was the principal economic activity. Donald Hardesty (1982) has provided a list of key scientific research questions for ranching sites in Nevada from which some of the following questions are derived. The arid environment of Hardesty's study area makes his work applicable to the Los Vaqueros Project area. Some of the issues identified below could be addressed using archeological data from a single site; others require comparative data. The primary question arising from this topic is:

- How did area ranchers adapt to their changing economic and environmental milieu? Subsets of this question include the following:
 - What were the effects on ranching operations of the change from the hide-and-tallow trade to the new demand for beef cattle?
 - How did the droughts of the 1860s, 1890s, and 1930s affect the local adaptations?
 - How was this related to the greater water requirements of beef cattle?
 - To what degree did subsistence agriculture increase during periods of economic decline for cattle ranchers?
 - To what extent were patterns of land use, development, and tenure associated with family developmental cycles (e.g., Praetzellis 1982)?
 - What was the effect on the natural environment of the managed ecosystem created by the ranchers?

- How did the economic strategies of owners differ from tenants? Which of the two groups fared better?

Contextual Requirements

- Definition of phases of land use, with emphasis on ranching.
- Definition of economics, technology, built environment, and landscape features associated with each phase.

Archeological Data Requirements

- Evidence of water management: the development of stock ponds, irrigation ditches, creek improvements, runoff impoundment devices, and wells.
- Evidence of feed storage and herd management facilities: use of natural features as corrals, creation of formal corrals, and creation of infrastructural facilities to accommodate import and/or storage of feed.
- Evidence of garden and pasture development: clearing, defining, and improving garden plots and pasture through water and soil management, fence building, and rock clearing.
- Evidence of plant succession, environmental change/degradation: analysis of historic pollen and soil characteristics such as mass wastage and erosional features caused by overgrazing.

Social Relations. Preliminary research indicates long-term residential stability in the Los Vaqueros uplands. Following the work of Bennett (1969), it is predicted that where competition for scarce resources, notably water and land, occurs in a context of long-term personal relationships, mechanisms would be established to avoid or resolve potential conflicts. The following issues would require archeological data from more than one property because they are comparative in nature.

- How were social relations managed within and between ranching units? Subsets of this question include the following:
 - What evidence exists for competition of resources in the study area?
 - To what degree was this based on ethnicity versus other factors?
 - How were physical and social boundaries given material form (e.g., Praetzellis et al. 1987)?

Contextual Requirements

- Reconstruction of local social networks.

- Definition of settlement pattern in relation to ethnicity and nationality.
- Reconstruction of ranch boundaries over time and in relation to ecological variables/resource availability.

Archeological Data Requirements

- Domestic refuse assemblages: material representing known social units at specific points in the past, with an adequate range/quantity of materials.
- Evidence of landscape features, particularly at ranch boundaries, over time: stone fences, tree lines, roads, and trails.

Application of the Modernization Model in the Los Vaqueros Uplands. The modernization of urban California occurred as the values of the commercial classes began to dominate within the middle class as a whole and to spread throughout California society. Time thrift, moderation, and a belief in material progress through commercialism were important elements of this new "Victorian" ideology. Frameworks for studying the breadth of this phenomenon have been suggested in archeological research designs by Wirth Associates (1980) and by Praetzellis (1991). The acculturative influence of Victorianization on Californio and Native American culture is discussed by Hoover and Costello (1985). Some of the following questions are derived from Hardesty's research (1982). Some of the issues identified below potentially could be addressed using archeological data from a single site; others require comparative data. The primary question related to this topic is:

- To what degree is the modernization model of social and cultural change relevant to the Los Vaqueros uplands? Subsets of this question include the following:
 - What evidence is there for continuity/change in Native American culture during the Mexican/American period?
 - To what degree was the opening up of trade in Alta California following the Gold Rush reflected on a household level?
 - Is there evidence that elements of traditional culture operated simultaneously with modern Victorian values?
 - Successful, urban Californios tended to embrace Americanization (e.g., Felton and Schulz 1983, Hoover and Costello 1985, Praetzellis 1987). Was this also true of less successful rural people?
 - Did the decline of the fortunes of the Mexican rancheros influence the intensity of their participation in Victorian values?
 - To what degree did Victorian values come to dominate in the Los Vaqueros uplands, and among what groups?

- How did rural patterns of ethnicity vary from urban patterns?
- How did this vary between households of differing economic, social, ethnic, and geographic characteristics?

Contextual Requirements

- Cost and availability of classes of domestic artifacts over time.
- Reconstruction, through the historical and ethnographic record, of ethnic and folk traditions represented by documented households.

Archeological Data Requirements

- Domestic refuse assemblages: material representing known social units at specific points in the past, with an adequate range/quantity of materials.
- Ranch complex layout and architecture: evidence of traditional versus modern/popular organization of space and architecture.
- Technology relating to ranching, building construction, and domestic activities: evidence of traditional versus modern practices in technology and construction.

FRAMEWORK FOR EVALUATION

The Los Vaqueros Project is a federally permitted undertaking. Decisions regarding management of cultural resources depend on determinations of their significance (36 CFR 60.2). As part of this decision-making process, the National Park Service has identified four components that must be considered in the evaluation process, including:

- criteria for significance;
- category of property (site, building, district);
- research potential, including historic context, themes, and period of significance; and
- integrity.

Each of these evaluation components is discussed in detail below.

Criteria for Significance

Significance of cultural resources is measured against the NRHP criteria for evaluation:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and,

- (a) That are associated with events that have made a significant contribution to the broad patterns of our history; or
- (b) That are associated with the lives of persons significant in our past; or
- (c) That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- (d) That have yielded, or may be likely to yield, information important in prehistory or history [35 CFR 60.4].

The principal state policy providing for the protection of historic properties, including prehistoric and historic archeological resources, is contained within CEQA Appendix K (14 Cal. Admin. Code 15000 et seq.), which outlines procedures appropriate for the protection and preservation of such resources. The California Health and Safety Code (Section 7052) prohibits the disturbance of human remains except under certain conditions and specifies procedures (Chapter 1492), including consultation with the California Native American Heritage Commission, to be followed in the event that Native American graves are found. Other sections of the Public Resources Code (Sections 5025, 5024.5, 5097.5, and 6313) prohibit unauthorized disturbance or removal of archeological or historical resources on public lands and specific procedures to be followed in the event that such resources are to be altered. The State Penal Code (Section 622.5) applies to objects of historical or archeological interest located on public or private lands and, specifically exempting the landowner, provides penalties for damaging such objects.

The State CEQA Guidelines define an important archeological resource as one which:

- A. Is associated with an event or person of
 - 1. Recognized significance in California or American history, or
 - 2. Recognized scientific importance in prehistory.

- B. Can provide information which is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable or archeological research questions;
- C. Has a special or particular quality such as oldest, best example, largest, or last surviving example of its kind;
- D. Is at least 100 years old and possesses substantial stratigraphic integrity; or
- E. Involves important research questions that historical research has shown can be answered only with archeological methods" [California Office of Planning and Research 1986].

In cases such as the Los Vaqueros Project where both CEQA and NRHP evaluation criteria apply, federal standards prevail. Historic properties assessed as NRHP eligible are also considered important under CEQA, and procedures for managing properties under 36 CFR 800 satisfy compliance with both the State CEQA Guidelines and Section 106 of the NHPA.

If, after identification and evaluation, an archeological deposit is determined to be significant under federal or state statutes, a mitigation plan must be prepared. Conversely, if an archeological resource is deemed nonsignificant, both the resource and the effect on it should be noted but need not be considered further in the CEQA process.

Property Category

Recognizing the inherent interrelationships that are often discernable among an area's cultural resources, the National Park Service has established the "district" as a descriptive and analytical category of significant property type. A district is defined as a geographically delineated area that possesses a significant concentration, linkage, or continuity of sites, buildings, structures, and/or objects united by past events or aesthetically by plan or physical development. The district concept redirects the evaluation focus from a site considered on its own merits to a site considered as a contributing element to a greater whole (36 CFR 60.3).

Based on the initial findings for the Los Vaqueros Project area, it is proposed that a district framework for evaluation is both appropriate and amenable to the research issues discussed above. The delineation of the proposed district (Map 1) is based on several factors, including the geographical confines of the watershed, the apparent cultural continuum exhibited by sites within the watershed, and the correlations with historical land claims (e.g., the Canada de Los Vaqueros land grant).

In addition to evaluating resources within a district framework, it may be appropriate to evaluate some sites individually. These sites may or may not have the potential to

contribute to the district, but may also be individually NRHP eligible because of other unique characteristics.

Research Potential

According to the U.S. Secretary of the Interior's Standards and Guidelines for Evaluation, the importance of an archeological property is determined by applying standard evaluation criteria of the NRHP within a developed historical context (36 CFR 60.4, 48 CFR 44724-44726). NRHP criterion d is normally used to evaluate archeological properties. This criterion addresses a site's research potential.

According to National Park Service guidelines (1982), an archeological property potentially eligible for the listing in the NRHP under criterion d, the potential to yield information important in prehistory or history, must have attributes that make it possible to do the following:

- test a hypothesis or hypotheses about events, groups, or processes in the past that bear on important research questions in the social or natural sciences or the humanities,
- corroborate or amplify available information suggesting that a hypothesis is either true or false, or
- reconstruct the sequence of archeological cultures for the purpose of identifying and explaining continuities and discontinuities in the archeological record for a particular area.

The historical context is a narrative statement "that groups information about a series of historic properties based on a shared theme, specific time period, and geographical area" (48 CFR 44739). To evaluate archeological resources in accordance with federal guidelines, these sites must be examined as examples of defined "property types". The property type is a "grouping of individual properties based on shared physical or associative characteristics" (48 CFR 4419). In this way, each site is viewed as a representative of a class of similar properties rather than as a unique phenomenon. The list of property types is developed from the historical context. For example, the property types defined for the historic context above under "Los Vaqueros Area Ranching Adaptations, 1835-1860" include the remains of adobe-built ranch houses and stone corrals and rodeo features. A well-developed historical context helps determine the association between property types and broad patterns of American history. Once this linkage is established, each resource's potential to address specific research issues can be explicated.

The Los Vaqueros area contains prehistoric, ethnohistoric, and historic sites ranging in time from at least 1,500 B.P. to the 1940s. While the determination of continuous occupation awaits further investigation, these resources appear to be linked because they illustrate settlement and subsistence patterns through time within an intermediate zone

situated between the Delta/Sacramento Valley, San Francisco Bay Area, and the Coast Ranges. As discussed in the "Research Orientation" section, settlement and subsistence is an important context in which to evaluate the importance of sites as contributing elements to a district. Within this context, several research issues and questions are identified (see "Research Orientation").

NRHP status of most archeological sites is determined by assessing their potential contribution to research issues raised in the historical context statement. Each site's potential to contribute individually or as a contributing element of a district is assessed.

National Register Bulletin 38 (National Park Service 1991) also identifies a class of properties, traditional cultural properties (TCP) distinct from those discussed above. Such properties derive their significance not from the property itself, but from the role the property plays in the cultural practices or beliefs of an extant community or identifiable social group. Examples of TCPs range from expansive geographic areas, such as the San Francisco Peaks in Arizona, which are well documented for their cultural importance for Native Americans, to individual structures or specific locations that may be associated with beliefs or practices of traditional cultural significance.

The evaluation of TCP significance is conducted with the same set of criteria as for historic property types. As a component of the evaluation process for the Los Vaqueros Project, both the project area and individual loci have been examined for potential traditional cultural significance. An extensive ethnographic survey was conducted in 1982 and is being supplemented by new ethnographic investigations for the Los Vaqueros Stage 2 EIR/EIS. Oral histories have been collected from individuals known to have familial or cultural ties to the area or specific locations. The results of these studies are incorporated into the overall findings of significance for the project.

Resource Integrity

For a property to be eligible for listing in the NRHP, it must meet one of the criteria for significance (36 CFR 60.4 [a,b, c, or d]) and retain integrity. Integrity is defined as "the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during the property historic or prehistoric period" (National Park Service 1982). NRHP-eligible properties must retain at least two of seven types of integrity, including integrity of location, design, setting, materials, workmanship, feeling, and association.

When properties are judged in relation to NRHP criterion d, the relationship between integrity and research potential becomes apparent. For an archeological site to be considered NRHP eligible, the site must retain integrity of location and setting with respect to the cultural materials and arrangement of those materials within the site. Simply stated, a property needs to retain enough of its original contents and condition to allow important research questions to be reasonably addressed (National Park Service 1982).

National Park Service draft guidelines (Knoerl 1986, National Park Service 1989) suggest that Deetz's concepts of focus and visibility are useful tools in assessing integrity under criterion d. Focus refers to the level of clarity with which the pattern of archeological remains can be seen to represent a particular phenomenon; visibility means the quantity of remains present on the site, interpretable or not (Deetz 1977).

Figure 12 (adapted from Knoerl 1986) shows that where visibility and focus are poor (on a site where the physical remains are few and so altered as to be uninterpretable) integrity is considered to be lacking and the site is likely to be ineligible for listing in the NRHP. Conversely, where both qualities are present, a property may be eligible under any or all of the four NRHP criteria (e.g., the site of a lumber mill where the water supply system, boiler pad, engine mounts, saw pit, and other essential features are clearly represented and unchanged).

For the present study, both integrity of setting and physical integrity have been classified as "excellent", "good", "fair", or "poor". These assessments are based on observation of surface manifestations. For example, resources in their original location, which have indications of intact setting and data potentials, are classified as having excellent integrity. Properties found to have good or fair integrity typically have research values that have been compromised to some degree by postdepositional activities and forces. Properties with minimal integrity are classified as poor, while some sites with no visible remains and no evidence of subsurface materials are classified as lacking integrity.

METHODS FOR EVALUATION

The following site evaluations are based on archeological, historical, and ethnographic research and field assessments. The purpose of archeological, historical, and ethnographic research is to establish a context through which properties can be assessed. During this phase, information has been gathered about the resources' histories, their place in the development of the region, and how they compare to other similar properties. This has been followed by an assessment to determine each site's current condition and potential to yield important information. The following outlines the information gathering steps that have been taken to evaluate the properties within the APE. Table 1 lists the sites by project component and property type, and lists the procedures used to determine their NRHP eligibility.

Federal guidelines state that two sets of information are necessary to evaluate cultural resources: an adequately developed historic context, including defined property types and sufficient information about each site to a) classify it by property type, b) compare its characteristics with those expected for the property type that it represents, and c) define its physical location and extent (48 CFR 44724). For archeological sites, parts b and c are generally addressed through test excavation. In the present case, however, sufficient information exists to make archeological testing unnecessary. The evaluations that follow take the position that sites that are representative of defined property types and have

Figure 12. Model of Archeological Integrity

Figure 12. Model of Archeological Integrity		
Good Focus	Good Visibility	Poor Visibility
	retains integrity under Crit. A, B, C, D	retains integrity under Crit. D
Poor Focus	integrity lacking	integrity lacking

Table 1. Evaluative Studies for the Los Vaqueros Project

Trinomial	Other Designation	Project Component	Property Type	Procedures
CA-CCo-6	LV-28	Watershed	Rock shelter	FLD CHK, PR
CA-CCo-9	LV-24	Recreation	Milling station	FLD CHK
CA-CCo-310	LV-10	Gas/access	Rock shelter	FLD CHK, PR
CA-CCo-397	LV-2	Access	Open site	FLD CHK, PR
CA-CCo-398	LV-32		Nonsite	FLD CHK, PR
CA-CCo-399	LV-33		Nonsite	FLD CHK, PR
CA-CCo-417	Locus 11	Gas/access	Rock shelter	FLD CHK, PR
CA-CCo-426H	Bordes tenant ranch	Watershed	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-427H	Bonfante tenant ranch	Reservoir	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-428		Access	Rock art	FLD CHK, PR
CA-CCo-434/H	Vasco Caves	Access	Rock shelter	FLD CHK, PR, OH, EH
CA-CCo-443H	Souza cookhouse	Watershed	Ancillary ranch complex	FLD CHK, OH, DOC, PR
CA-CCo-444H	Cabral tenant ranch	Watershed	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-445H	Tony Rose tenant ranch	Reservoir	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-446H	Raffett tenant ranch	Access	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-447/H		Access/recreation	Unknown	FLD CHK, PR
CA-CCo-447	LV-9	Access/recreation	Open site	FLD CHK, PR
CA-CCo-448H	Fragulia tenant ranch	Watershed	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-449/H	Red barn	Reservoir	Ancillary complex	FLD CHK, OH, DOC, PR
CA-CCo-449	LV-14	Reservoir	Nonsite	FLD CHK
CA-CCo-450/H	Upper/Alviso adobe	Access/recreation	Ranch headquarters	OH, DOC, PR
CA-CCo-450	Upper adobe	Access/recreation	Ranch site	FLD CHK, EH
CA-CCo-451H	Starr water tanks	Access	Water management feature	FLD CHK, PR
CA-CCo-452	LV-25	Recreation	Milling station	FLD CHK, PR
CA-CCo-453H	Vallerga tenant ranch	Recreation	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-454H	Los Vaqueros sheep camp	Access	Ancillary ranch complex	FLD CHK, PR, OH
CA-CCo-455	LV-5	Access	Rock shelter	FLD CHK, PR
CA-CCo-456	LV-6	Access	Rock shelter	FLD CHK, PR
CA-CCo-457	LV-8	Watershed	Milling station	FLD CHK, PR
CA-CCo-458/H		Reservoir	Isolated refuse dump	PR, FLD CHK
CA-CCo-458	LV-13	Reservoir	Open site	FLD CHK, PR
CA-CCo-459		Reservoir	Milling station	FLD CHK, PR
CA-CCo-460/H	Horse pasture corral	Access	Stone corral	FLD CHK, DOC, PR
CA-CCo-460	LV-18	Access	Rock shelter	FLD CHK, PR
Ca-CCo-461	LV-19	Access	Open site	FLD CHK, PR
CA-CCo-462	LV-31	Access/recreation	Milling station	FLD CHK, PR

Table 1. Continued

Trinomial	Other Designation	Project Component	Property Type	Procedures
CA-CCo-463		Access	Open site	FLD CHK, PR
CA-CCo-464	LV-27	Access	Milling station	FLD CHK, PR
CA-CCo-465	LV-29	Access	Milling station	FLD CHK, PR
CA-CCo-467/H		Access	Water management feature	FLD CHK, DOC, OH, PR
CA-CCo-467	LV-20	Access	Milling station	FLD CHK, PR
CA-CCo-468	LV-35	Reservoir	Milling station	FLD CHK, PR
CA-CCo-469	LV-37	Reservoir	Milling station	FLD CHK, PR
CA-CCo-470H	Lower adobe/Starr ranch	Reservoir	Ranch headquarters	FLD CHK, DOC, OH, PR
CA-CCo-471H	Vasco School	Reservoir	Historic location	FLD CHK, OH, PR
CA-CCo-477	Rattlesnake Caves	Road	Rock shelter	FLD CHK, PR
CA-CCo-533H	Barkley homestead	Access	Ranch headquarters	OH, DOC, PR
CA-CCo-534H	Baker farmstead	Access	Ranch headquarters	OH, DOC
CA-CCo-535H	Easton/Grueninger farmstead	Recreation	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-536H	Tenant ranch	Watershed	Ranch headquarters	DOC, OH, PR
CA-CCo-537H	Grueninger homestead	Watershed	Ranch headquarters	OH, DOC
CA-CCo-543/H	Murphy ranch	Utility	Ranch headquarters	FLD CHK, DOC, PR
CA-CCo-543		Utility	Large occupation site	FLD CHK, PR
CA-CCo-546H	Connolly/Pimental tenant ranch	Road	Ranch headquarters	FLD CHK, DOC, OH, PR
CA-CCo-554		Watershed	Milling station	PR
CA-CCo-555	Canyon milling site	Watershed	Milling station	FLD CHK, PR
CA-CCo-556		Watershed	Milling station	FLD CHK, PR
CA-CCo-557		Watershed	Milling station	PR
CA-CCo-558		Watershed	Open site	FLD CHK, PR
CA-CCo-559	Buckeye Flat	Watershed	Open site	FLD CHK, PR
CA-CCo-560/H	Los Vaqueros boundary corral No. 1	Fire/access	Stone corral	FLD CHK, DOC, PR
CA-CCo-560		Fire/access	Open site	FLD CHK, PR
CA-CCo-561H	Nunez ranch	Watershed	Ranch headquarters	DOC, PR
CA-CCo-562H	Valenzuela homestead	Watershed	Ranch headquarters	PR
CA-CCo-563H	Whetfield homestead	Watershed	Ranch headquarters	PR
CA-CCo-564H	Los Vaqueros fence	Watershed	Stone fence	PR, DOC
CA-CCo-565H	Los Vaqueros boundary corral No. 2	Fire/access	Stone corral	PR, DOC
CA-CCo-566/H	Peres corral	Watershed	Stone corral	PR, DOC, FLD CHK
CA-CCo-566	Community mortar site	Watershed	Milling station	FLD CHK, PR
CA-CCo-567H	Camoza farmstead	Watershed	Ranch headquarters	DOC, OH, PR
CA-CCo-568		Watershed	Milling station	FLD CHK, PR
CA-CCo-569H	Coates/Ferrario tenant ranch	Watershed	Ranch headquarters	FLD CHK, OH, DOC, PR

Table 1. Continued

Trinomial	Other Designation	Project Component	Property Type	Procedures
CA-CCo-628H	Armstrong residence	Road	Domestic remains	FLD CHK, OH, DOC
CA-CCo-629H	J. Armstrong farmstead	Road	Ranch headquarters	FLD CHK, OH, DOC, PR
CA-CCo-630H	Hoskar farmstead	Road	Ranch headquarters	FLD CHK, DOC, OH
CA-CCo-636	Dam site	Dam and spillway	Open site	FLD CHK, PR
CA-CCo-637	Hoppar mortar site	Reservoir	Open site	FLD CHK, PR
CA-ALa-536H	Jason/Redin tenant ranch	Road	Ranch headquarters	FLD CHK, OH, DOC, PR
S-20		Old River No. 5	Open site	FLD CHK

Notes: FLD CHK = site has been field checked as part of this phase of work.
 DOC = archival/historical research.
 OH = oral history/interviewing.
 PR = review of previous research for Los Vaqueros Project.
 EH = ethnohistory.

Sites with both prehistoric and historic components are listed separately.

See Appendix B for evaluation of architectural resources.

Ancillary Farm/Ranch Complex: the presence of one or more of the feature types listed under farm/ranch headquarters suggesting temporary domestic occupation associated with some animal management feature, such as a corral.

Domestic Remains: the isolated occurrence of one or more of the feature types listed under farm/ranch headquarters. Such a site may represent an undocumented farm/ranch headquarters.

Farm/Ranch Headquarters: a feature system that is either the historically documented headquarters of a farming or ranching operation or that contains archeological features that indicate such use. Common feature types include building platforms, terracing, footings, cellar holes, chimney bases, dugouts, hand-dug wells, exotic vegetation, and sheet deposits of domestic refuse.

Historic Location: no remains found.

Isolated Refuse Dump: the presence of historic-period refuse without any of the other features listed under farm/ranch headquarters.

Large Occupation Site/Small Village: large midden deposit.

Milling Station: bedrock mortar with no apparent subsurface material.

Table 1. Continued

Trinomial	Other Designation	Project Component	Property Type	Procedures
				Nonsite: area previously recorded but not relocated or site record not substantiated.
				Open Site: midden with or without milling features.
				Ranch Site: Native American site that may be associated with historic occupation.
				Rock Shelter: a rock shelter that may have milling features and/or minor quantity of rock art.
				Rock Art: rock art with no other cultural feature.
				Stone Corral: isolated.
				Stone Fence: isolated/boundary.
				Recent: nonhistoric deposit.
				Water Management Features: individual associated features, including the remains of water tanks, spring improvements, wind pumps/troughs, reservoirs/stock ponds, and ditches.

retained substantial integrity are eligible for listing in the NRHP under criterion d, and to a more limited degree, other criteria.

In summary, the assessment of a resource's NRHP eligibility is based on meeting two conditions:

- the site must possess the potential to be eligible for listing in the NRHP under one of the evaluation criteria either individually or as a contributing element of a district based on the historic context that is established and
- the site must possess sufficient integrity (i.e., it must retain the qualities that make it eligible for listing in the NRHP).

*what
are
the eval
criteria*

Prefield Studies

During the course of 12 years of inventory and investigations, considerable research has been conducted for the Los Vaqueros Project area and vicinity. The result is an extensive body of information on the prehistory, ethnography, and history of the area. This information, summarized in the "Cultural Background" section, provides the cultural context in which to evaluate the significance of cultural resources within the Los Vaqueros Project area.

Field Studies

Numerous cultural resource studies have been conducted for the project during the past decade (see "Previous Investigations in the Project Area"). The result of this body of work has been the recordation of 68 resources within the APE.

To determine NRHP eligibility of these resources requires data to be collected on their physical characteristics and research potential or other attributes that might make the sites important. The term "physical characteristics" means information about site structure and content, the range and frequency of types of artifacts, the presence of various types of archeological features (e.g., bedrock mortars, hearths, refuse pits, cellar holes), and the physical processes by which the site or its components were created or transformed (e.g., by fire, flood, rodent activity) and the site's integrity.

Because much of the research at Los Vaqueros was completed 10 years ago, evaluation of these resources required a reassessment to verify their recorded attributes, current condition, and eligibility for listing in the NRHP either individually or as a contributing element to the district. This information was used, to the extent possible, using observations of surface manifestations in conjunction with historic context information to assess a sites' significance.

RECOMMENDATIONS FOR NRHP ELIGIBILITY

Sixty-eight resources have been identified within the APE for the Los Vaqueros Project as being recommended for listing in the NRHP. Appendix A contains summary evaluation forms listing each site's context and period of significance and a significance evaluation statement. Appendix B contains the architectural inventory report for the Los Vaqueros Project, including the inventory forms and eligibility recommendations.

Table 2, summarized below, provides information on each site's integrity and whether it is ineligible, eligible as a component of a district, or eligible individually. There are 62 properties that appear to meet the criteria for NRHP eligibility. In all cases, the eligibility criteria are the same for those properties eligible both individually and as contributing elements.

ASSESSMENTS OF EFFECTS

Regulatory Context for Determination of Effect

Advisory Council on Historic Preservation (ACHP) regulations define APEs as geographic areas "within which an undertaking may cause changes in the character or use of historic properties" (36 CFR 800.2[c]). The APE for the Los Vaqueros Project corresponds roughly with the upper Kellogg Creek watershed boundary, the location of proposed project components, and linear alignments for water conveyance facilities and utility relocations (Maps 1 and 2).

Assessment of the project's effects requires determining how the undertaking will affect those attributes of historic properties that make them NRHP eligible. For most properties within the APE, determination of how the project will affect the scientific data potential (NRHP criterion d) is the primary consideration, although other values covered under criteria a and c, as well traditional cultural values are also considered.

Because properties within the APE may be eligible individually or as a contributing element to a historic district, the project effects to each site and the district must be assessed. The category NRHP district implicitly recognizes that the importance of the whole is greater than the sum of its contributing parts; the research values contained in the LVNRD's sites can be fully understood only in relation to each other. Thus, invoking the district designation has implications for the treatment of historic properties.

By definition, the loss of a single contributing element within an NRHP district has a deleterious effect on the integrity and research potential of the remaining contributing elements and on the district as a whole. If a project component affects one contributing element of the district, it affects the entire district.

Table 2. Summary of Cultural Resources Evaluations for the Los Vaqueros Project

	Trinomial	Other Designation	Integrity	Ineligible	Eligible District	Individually Eligible
1	CA-CCo-6	LV-28	I-G		d	d
2	CA-CCo-9	LV-24	I-E		d	d
3	CA-CCo-310	LV-10	I-E		d	d
4	CA-CCo-397	LV-2	I-F		d	d
5	CA-CCo-398	LV-32	I-F		d	d
6	CA-CCo-399	LV-33	I-F		d	d
7	CA-CCo-417	Locus 11	I-E		d	d
1	CA-CCo-426H	Bordes tenant ranch	I-E		d	
2	CA-CCo-427H	Bonfante tenant ranch	I-G		d	
8	CA-CCo-428		I-E		d	d
9	3 CA-CCo-434/H	Vasco Caves	I-E		d	d
4	CA-CCo-443H	Souza cookhouse	I-P/L	X		
5	CA-CCo-444H	Cabral tenant ranch	I-G		d	
6	CA-CCo-445H	Tony Rose tenant ranch	I-E/G		d	
7	CA-CCo-446H	Raffett tenant ranch	I-E/G		d	
10	CA-CCo-447/H		I-G		d	
—	CA-CCo-447	LV-9	I-E		d	d
—	CA-CCo-448H	Fragulia tenant ranch	I-L	X		
—	CA-CCo-449/H	Red barn	I-L	X		
8	CA-CCo-449	LV-14	I-L	X		
11	CA-CCo-450/H	Upper/Alviso adobe	I-E/G		a,d	a,d
—	CA-CCo-450	Upper/Alviso adobe	I-F		d	d
—	CA-CCo-451H	Starr water tanks	I-L	X		
12	CA-CCo-452	LV-25	I-E		d	
9	CA-CCo-453H	Vallerga tenant ranch	I-G		d	
13	CA-CCo-454H	Los Vaqueros sheep camp	I-E/G		c,d	c,d
14	CA-CCo-455	LV-5	I-E		d	d
15	CA-CCo-456	LV-6	I-E		d	
16	CA-CCo-457	LV-8	I-E		d	
—	CA-CCo-458/H		I-L	X		
17	CA-CCo-458	LV-13	I-G		d	d
18	CA-CCo-459	LV-15	I-E		d	
19	CA-CCo-460/H	Horse pasture corral	I-E/G		c,d	
20	CA-CCo-460	LV-18	I-E		d	d
21	CA-CCo-461	LV-19	I-E		d	d
22	CA-CCo-462	LV-31	I-E		d	
23	CA-CCo-463	LV-26	I-E		d	d
24	CA-CCo-464	LV-27	I-E		d	
25	CA-CCo-465	LV-29	I-E		d	
26	CA-CCo-467/H		I-G/F		d	
27	CA-CCo-467	LV-20	I-E		d	d
28	CA-CCo-468	LV-36	I-U		d	
29	CA-CCo-469	LV-37	I-E		d	
30	CA-CCo-470H	Lower adobe/Starr ranch	I-U		c,d	c,d
31	CA-CCo-471H	Vasco School	I-L	X		
32	CA-CCo-477	Rattlesnake Caves	I-E		d	d
33	CA-CCo-533H	Barkley homestead	I-G		d	
34	CA-CCo-534H	Baker farmstead	I-G/E		d	
35	CA-CCo-535H	Easton/Grueninger ranch	I-G		d	
36	CA-CCo-536H	Tenant ranch	I-U		d	
37	CA-CCo-537H	Grueninger homestead	I-U		d	

Table 2. Continued

Trinomial	Other Designation	Integrity	Ineligible	Eligible District	Individually Eligible
19 CA-CCo-543/H	Murphy ranch	I-E/G		d	
28 CA-CCo-543		I-E		d	d
20 CA-CCo-546H	Connolly/Pimentel tenant ranch	I-G		d	
20 CA-CCo-554		I-E		d	
30 CA-CCo-555	Canyon milling site	I-E		d	
31 CA-CCo-556	Bay Knoll	I-E		d	
31 CA-CCo-557		I-E		d	
31 CA-CCo-558		I-E		d	d
31 CA-CCo-559	Buckeye Flat	I-E		d	d
21 CA-CCo-560/H	Boundary corral No. 1	I-G		d	
35 CA-CCo-560		I-E		d	d
22 CA-CCo-561H	Nunez ranch	I-G/F		d	
23 CA-CCo-562H	Valenzuela homestead	I-E/G		d	d
24 CA-CCo-563H	Whetfield homestead	I-E/G		d	
25 CA-CCo-564H	Los Vaqueros fence	I-E/G		a,c,d	a,c,d
26 CA-CCo-565H	Boundary corral No. 2	I-E/G		c,d	c,d
27 CA-CCo-566/H	Peres corral	I-E/G		c,d	c,d
36 CA-CCo-566	Community mortar site	I-G		d	d
28 CA-CCo-567H	Camoza farmstead	I-E/G		d	
32 CA-CCo-568		I-G		d	
29 CA-CCo-569H	Coates/Ferrario tenant ranch	I-G		d	
CA-CCo-628H	Armstrong residence	I-L	X		
30 CA-CCo-629H	J. Armstrong farmstead	I-G		d	
31 CA-CCo-630H	Hoskar farmstead	I-G		d	
32 CA-CCo-636	Hopper mortar site	I-G		d	d
34 CA-CCo-637	Dam site	I-F		d	d
32 CA-ALa-536H	Jason/Redin tenant ranch	I-G		d	
40 S-20		I-U		d	d

Note: See Appendix B for evaluation of architectural resources.

Integrity level definitions:

I-E = excellent.
 I-G = good.
 I-F = fair.
 I-P = poor.
 I-L = lacking.
 I-U = unknown.

Ineligible = believed to be ineligible to NRHP individually or as part of district; not important under CEQA.

Eligible District = believed to be contributing element of Los Vaqueros Historic District.

Individually Eligible = believed to be individually eligible to the NRHP; important under CEQA.

a = appears to be eligible under NRHP criterion a.
 b = appears to be eligible under NRHP criterion b.
 c = appears to be eligible under NRHP criterion c.
 d = appears to be eligible under NRHP criterion d.

Three possible findings of effect can be made; no effect, no adverse effect, and adverse effect. ACHP regulations define an undertaking such as the Los Vaqueros Project as having an effect on historic property when the undertaking:

may alter the characteristics of the property that may qualify the property for inclusion in the NRHP, including alteration of the property's location, setting, or use. An undertaking may have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:

- physical destruction or alteration of all or part of the property;
- isolation of the property from or alteration of the property's setting when that character contributes to the property's qualification for the NRHP;
- introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
- neglect of a property resulting in its deterioration or destruction; and
- transfer, lease, or sale of the property [36 CFR 800.9].

When it appears that the project will have an adverse effect on sites that are contributing elements of a district or are individually eligible for listing in the NRHP, steps can be taken to reduce effects to that of no adverse effect when:

- the historic property is of value only for its potential contribution to archeological, historical, or architectural research [criterion d], and when such value can be substantially preserved through the conduct of appropriate research, and such research is conducted in accordance with applicable professional standards and guidelines; *and through an approved research design*
- the undertaking is limited to the rehabilitation of buildings and structures and is conducted in a manner that preserves the historical and architectural value of affected historic property through conformance with the Secretary's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings"; or
- the undertaking is limited to the transfer, lease, or sale of a historic property and adequate restrictions or conditions are included to ensure preservation of the property's significant historic features [36 CFR 800.9(c)].

Effects on Properties within the Los Vaqueros Project APE

The Los Vaqueros Project could affect, historical, archeological, architectural, and traditional cultural properties eligible for listing in the NRHP. Impacts could result from the physical disturbance of cultural resources during construction or construction-related activities; increased access; demolition, removal or alteration of historically or architecturally significant structures; management of watershed lands; and introduction of visual elements that could alter the setting, integrity of location, or feeling associated with historic properties.

Project components could adversely affect historic properties either directly or indirectly. Direct impacts may occur when impacts on historic properties cannot be avoided through project redesign or other methods. Demolition or inundation of historic buildings and bulldozing of an archeological site are examples of direct effects. Historic properties could also be affected by indirect impacts resulting from increased access into the project area, including vandalism and pot hunting. Other indirect impacts could result from increased erosion in the project area as a result of project components and from impacts resulting from watershed management practices.

Within the APE, areas of direct impact and potential indirect impact have been identified for the following project components:

- Los Vaqueros reservoir, dam, and spillway;
- Vasco Road relocation;
- utility relocation alignments;
- Los Vaqueros pipeline;
- Old River No. 5 pipeline;
- fire management;
- recreation facilities;
- access; and
- watershed management practices.

Table 3, summarized below, lists the potential effects for all sites within the APE for each project component as they are currently configured.

Los Vaqueros Reservoir, Dam, and Spillway; Vasco Road Relocation; Utilities Relocations; Recreation Facilities; and Fire Management

Sites listed under these components are assumed to be adversely affected by facility construction or operation. However, effects on some or all of these sites may be avoided through project redesign, protection measures, or data recovery. Implementing these measures would result in no effect or no adverse effects to the resource.

Can/should we delay these determinations, I suspect that greater specificity is needed.

For planning purposes, based on information

Table 3. Management Recommendations

Trinomial	Other Designation	Property Type	Status	Potential Effects	Management Recommendations
CA-CCo-6	LV-28	RS	ELIG, DIST	Watershed management	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-9	LV-24	MS	ELIG, DIST	Recreation	Avd,LTM:ES,COL,MAP,PDH,PCM or PDR,PCM
CA-CCo-310	LV-10	RS	ELIG, DIST	Utility/access	Avd,EZ,AMC,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-397	LV-2	OS	ELIG, DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-398	LV-22	OS	ELIG, DIST	None	NFM
CA-CCo-399	LV-33	OS	ELIG, DIST	None	NFM
CA-CCo-417	Locus 11	RS	ELIG, DIST	Utility/access	Avd,EZ,AMC, LTM:ES,COL,MAP,PHD,PCM or PDR,AMC,PCM
CA-CCo-426H	Bordes tenant ranch	RH	DIST	Watershed management	Avd,LTM:OH,DOC,PCM
CA-CCo-427H	Bonfante tenant ranch	RH	DIST	Reservoir	PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-428		RA	DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-434/H	Vasco Caves	RS	ELIG, DIST	Access	EZ,LTM:ES,COL,MAP,PHD,OH,EH,PCM
CA-CCo-443H	Souza cookhouse	AC/RH	INEL	Watershed management	NFM
CA-CCo-444H	Cabral tenant ranch	RH	DIST	Watershed management	Avd,COL,LTM:OH,DOC,PCM
CA-CCo-445H	Tony Rose tenant ranch	RH	DIST	Reservoir	PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-446H	Raffett tenant ranch	RH	DIST	Access	Avd,LTM:OH,DOC,PCM or PDR:OH,DOC,AE,MAP,PHD,PCM
CA-CCo-447/H		Unknown	DIST	Access/recreation	PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-447	LV-9	OS	ELIG, DIST	Access/recreation	PDR:ES,HE,AE,MAP,PHD
CA-CCo-448H	Fragulia tenant ranch	RH	INEL	Watershed	NFM
CA-CCo-449/H	Red barn	AC/R	INEL	Reservoir	NRM
CA-CCo-449	LV-14	NS	INEL	Reservoir	NFM
CA-CCo-450/H	Upper/Alviso adobe	RH	ELIG, DIST	Access/recreation	PDR:ES,OH,EH,DOC,HE,AE,MAP,PHD;LTM:Avd,PCM,PI
CA-CCo-450	Upper/Alviso adobe	OS	ELIG, DIST	Access/recreation	PDR:ES,COL,MAP,PHD;LTM:Avd,PCM
CA-CCo-451H	Starr water tanks	WM	INEL	Access	NFM
CA-CCo-452	LV-25	MS	DIST	Recreation	Avd,LTM:ES,COL,PCM or PDR:ES,COL,MAP,PHD,PCM
CA-CCo-453H	Vallerga tenant ranch	RH	DIST	Recreation	PDR:OH,DOC,HE,AE,MAP,PHD; LTM:PI
CA-CCo-454H	Los Vaqueros sheep camp	AC	ELIG, DIST	Access	PDR:OH,DOC,ES,COL,AE,MAP,PHD; LTM:Avd,PCM
CA-CCo-455	LV-5	RS	ELIG, DIST	Access	Avd,LTM:ES,MAP,PHD,COL,PCM or PDR,PCM
CA-CCo-456	LV-6	RS	DIST	Access	Avd,LTM:ES,MAP,PHD,COL,PCM or PDR,PCM
CA-CCo-457	LV-8	MS	DIST	Watershed	Avd,LTM:ES,MAP,PHD,COL,PCM
CA-CCo-458/H		RD	INEL	Reservoir	NFM
CA-CCo-458	LV-13	OS	ELIG, DIST	Reservoir	PRD:ES,COL,MAP,PHD
CA-CCo-459	LV-15	MS	DIST	Reservoir	PDR:ES,COL,MAP,PHD
CA-CCo-460/H	Horse pasture corral	SC	DIST	Access	Avd,LTM:OH,DOC,ES,PCM or PDR:OH,DOC,AE,ES,MAP,PHD,PCM
CA-CCo-460	LV-18	RS	ELIG, DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-461	LV-19	OS	ELIG, DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-462	LV-31	MS	DIST	Access/recreation	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-463	LV-26	OS	ELIG, DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-464	LV-27	MS	DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-465	LV-29	MS	DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-467/H		WM, possible RH	DIST	Access	Avd,LTM:OH,DOC,PCM or PDR:OH,DOC,AE,MAP,PHD,PCM
CA-CCo-467	LV-20	MS	ELIG, DIST	Access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-468	LV-36	MS	DIST	Reservoir	PDR:ES,COL,MAP,PHD

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Table 3. Continued

Trinomial	Other Designation	Property Type	Status	Potential Effects	Management Recommendations
CA-CCo-469	LV-37	MS	DIST	Reservoir	PDR:ES,COL,MAP,PHD
CA-CCo-470H	Lower adobe/Starr ranch	RH	ELIG, DIST	Reservoir	PDR:PH,DOC,HE,AE,MAP,PHD,RB
CA-CCo-471H	Vasco School	HL	INEL	Reservoir	NFM
CA-CCo-477	Rattlesnake Caves	RS	ELIG, DIST	Road	Avd,EZ,AMC or PDR:ES,COL,MAP,PHD,AMC
CA-CCo-533H	Barkley homestead	RH	DIST	Access	Avd,LTM:OH,DOC,PCM,ES
CA-CCo-534H	Baker farmstead	RH	DIST	Access	Avd,LTM:OH,DOC,CD,PCM or PDR:OH,DOC,HE,AE,MAP,PHD,PCM
CA-CCo-535H	Easton/Grueninger farmstead	RH	DIST	Recreation	PDR:OH,DOC,HE,AE,MAP,PHD,PI
CA-CCo-536H	Tenant ranch	RH	DIST	Watershed	Avd,LTM:OH,DOC,ES,PCM
CA-CCo-537H	Grueninger homestead	RH	DIST	Watershed	Avd,LTM:OH,DOC,ES,PCM
CA-CCo-543/H	Murphy ranch	RH	DIST	Utility	Avd,EZ or PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-543		LS	ELIG, DIST	Utility	Avd,EZ or PDR:ES,COL,MAP,PHD
CA-CCo-546H	Connolly tenant ranch	RH	DIST	Road	PDR:OH,DOC,AE,MAP,PHD,ES,PCM
CA-CCo-554		MS	DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-555		MS	DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-556	Bay Knoll	MS	DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-557		MS	DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-558		OS	ELIG, DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-559	Buckeye Flat	OS	ELIG, DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-560/H	Boundary corral No. 1	SC	DIST	Fire/access	Avd,LTM:OH,ES,MAP,PHD,PCM or PDR:OH,ES,MAP,PHD,PCM
CA-CCo-560		OS	ELIG, DIST	Fire/access	Avd,LTM:ES,COL,MAP,PHD,PCM or PDR,PCM
CA-CCo-561H	Nunez ranch	RH	DIST	Watershed	Avd,LTM:OH,DOC,CD,PCM
CA-CCo-562H	Valenzuela homestead	RH	ELIG, DIST	Watershed	Avd,LTM:OH,DOC,PCM
CA-CCo-563H	Whetfield homestead	RH	DIST	Watershed	Avd,LTM:OH,DOC,PCM
CA-CCo-564H	Los Vaqueros fence	SF	ELIG, DIST	Watershed	Avd,LTM:OH,DOC,ES,PCM
CA-CCo-565H	Boundary corral No. 2	SC	ELIG, DIST	Fire/access	Avd,LTM:OH,DOC,ES,PCM or PDR:OH,DOC,ES,PHD,MAP,PCM
CA-CCo-566/H	Peres corral	SC	ELIG, DIST	Watershed	Avd,LTM:OH,DOC,ES,PCM
CA-CCo-566	Community mortar site	MS	ELIG, DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-567H	Camoza farmstead	RH	DIST	Watershed	Avd,LTM:OH,DOC,ES,PCM
CA-CCo-568		MS	DIST	Watershed	Avd,LTM:ES,COL,MAP,PHD,PCM
CA-CCo-569H	Coates/Ferrario tenant ranch	RH	DIST	Watershed	Avd,LTM:OH,DOC,PCM
CA-CCo-628H	Armstrong residence	DR	INEL	Road	NFM
CA-CCo-629H	J. Armstrong farmstead	RH	DIST	Road	Avd,EZ or PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-630H	Hoskar farmstead	RH	DIST	Road	Avd,EZ or PDR:OH,DOC,HE,AE,MAP,PHD
CA-CCo-636	Hopper mortar site	OS	ELIG, DIST	Reservoir	PDR:ES,COL,MAP,PHD
CA-CCo-637	Dam site	OS	ELIG, DIST	Dam and spillway	PDR:ES,COL,MAP,PHD
CA-ALa-536H	Jason/Redin tenant ranch	RH	DIST	Road	PDR:OH,DOC,HE,AE,MAP,PHD
S-20		OS	ELIG, DIST	Old River No. 5	Avd:MAP,AUG,PDR

Notes: Property Type (see Table 1 for property type definitions):

- AC = ancillary farm/ranch complex.
- DR = domestic remains.
- HL = historic location, no remains found.

Table 3. Continued

Trinomial	Other Designation	Property Type	Status	Potential Effects	Management Recommendations
LS	= large occupation site/small village.				
MS	= milling station.				
OS	= open site.				
R	= recent/nonhistoric deposit.				
RA	= rock art.				
RD	= isolated refuse dump.				
RH	= farm/ranch headquarters.				
RS	= rock shelter.				
SC	= stone corral.				
SF	= stone fence.				
WM	= water management feature.				
Status (National Register/CEQA):					
ELIG	= believed individually NRHP eligible; important under CEQA.				
DIST	= believed NRHP eligible as a contributing element of National Register District.				
INEL	= believed NRHP ineligible, noncontributing; not important under CEQA.				
Potential Impacts:					
Access	= access related impacts.				
Fire	= fire management related impacts.				
Recreation	= recreation related impacts.				
Reservoir	= reservoir inundation.				
Road	= road construction or improvement.				
Utilities	= utility relocation activities (i.e., pipeline construction).				
Watershed	= no immediate impacts identified; cumulative impacts will result in loss of sites within district as a result of the implementation of other project components.				
Management Recommendations:					
AE	= areal excavation; open area, stratigraphic excavation.				
AMC	= archeological monitoring of construction.				
AUG	= augering.				
Avd	= avoidance through project plans.				
CD	= controlled destruction, usually the removal of structural timbers that draw attention to a site and provoke vandalism.				
COL	= collect surface artifacts to discourage vandalism.				
DOC	= archival/historical research.				
EH	= ethnohistory/ethnography.				
ES	= enhanced survey to locate additional site elements, including subsurface investigation as appropriate.				
EZ	= exclusion zone.				
HE	= use of heavy equipment to expose buried features.				
LTM	= long-term management of sites contributing to district, including projectwide historical research, oral history, and ethnohistory, postconstruction monitoring, plan for public involvement and outreach, and other studies as indicated. May include enhanced survey with the possibility of test excavations and additional recording of site elements.				
MAP	= mapping, additional site recording/structure recording.				
NFM	= no further management recommended.				
OH	= oral history/interviewing (includes both transcribed interviews and less formal, but documented, interviews).				

Table 3. Continued

PCM	= postconstruction monitoring.
PDR	= phased integrated data recovery program/treatment plan may include hand excavation, use of heavy equipment to expose buried features, mapping, photodocumentation, oral history, and documentary research.
PHD	= photo-documentation.
PI	= public involvement, noted on sites that would make good focus for interpretive display.
RB	= remove buildings and large artifacts (e.g., farm machinery) to location within watershed for use in interpretive display.

Los Vaqueros Pipeline

One property (the Contra Costa Canal) located within the APE for the Los Vaqueros pipeline is recommended for individual listing in the NRHP under criterion a (Appendix B). This component of the project requires that the Los Vaqueros pipeline be connected to the Contra Costa Canal. Connecting these two water conveyance facilities will not adversely affect the qualities that qualify the property for the NRHP.

Old River No. 5 Pipeline

what resource site
It is assumed that this resource, if present, will be adversely affected by construction of the Old River No. 5 pipeline. However, impacts on this site may be avoided through project redesign, protection measures, or data recovery. Implementing these measures would result in no effect or no adverse effects to the resource.

Access

It is assumed that sites listed under this component will be adversely affected by increased access into the area resulting from the project. However, effects to some or all of these sites may be avoided through project redesign, protection measures, or data recovery. Implementing these measures would result in no effect or no adverse effects to the resource.

Watershed Management

It is assumed that sites listed under this component could be adversely affected by watershed management activities. However, effects to some or all of these sites may be avoided through project redesign, protection measures, or data recovery. Implementing these measures would result in no effect or no adverse effects to the resource.

MANAGEMENT RECOMMENDATION AND CONCLUSIONS

A phased treatment program is outlined below to avoid, reduce, or minimize effects on historic properties within the APE for the Los Vaqueros Project. Table 3 provides site-specific options that can be used to meet this objective. These recommendations will be codified within the framework of historic property treatment plans (HPTP) as outlined in the programmatic agreement for the project and discussed below.

Work conducted for this evaluation revealed that an extensive body of ethnographical and historical data for the region needs to be collected before the project is implemented. It is proposed that the first phase of treatment consist of targeted historic and ethnohistoric research for the LVHRD. This phase would encompass the entire LVNRD and be conduc-

ted before treatment phases. Once Phase 1 is completed, further phases of treatment will begin. Phase 2 treatment will be conducted on a site-by-site basis and triggered by the scheduling for construction of project components.

Table 3 lists a range of specific management options that may be appropriate for Phase 2 treatment. Use of these options depends on several factors, including the findings of effect derived from this document, results of Phase 1 research, and any subsequent modifications to the area of direct effect and changes in the effects of the project on the qualities that make resources eligible for NRHP listing.

The management options for Phase 2 outlined in Table 3 fall into two categories. The first consists of procedures to avoid or manage impacts, including avoidance through project redesign, monitoring, capping, and fencing implemented through the development of a cultural resource management plan. If the above measures are infeasible, a second level of treatment would be conducted consisting of documentation of each site's contents, and, if necessary, retrieval of significant data. Treatment ends when potential to yield significant data has been exhausted.

The management recommendations outlined above are developed primarily for properties and contributing elements that are NRHP eligible under criterion d. Use of these management options are also appropriate for properties and contributing elements eligible under criteria a and c. Refer to Appendix A for specific management options for these sites.

Selection of management options would occur after Phase 1 research is completed and identified in a HPTP prepared for each eligible property or contributing element(s) affected by a project component. Implementing these management options as appropriate will reduce adverse effects to the LVNRD and individually eligible properties to either no adverse effect or no effect.

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